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STATE SUPREME COURT

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# Onus on firms to disclose bad water

By Bob Egelko
CHRONICLE STAFF WRITER

Government agencies that oversee thousands of small water suppliers in California don't have to order the companies to notify their customers when their water is contaminated, the state Supreme Court has ruled.

The court ruled Monday in a case brought by about 80 residents of a Carmel Valley mobile home park, who blamed ailments ranging from rotted teeth and brittle bones to lost kidneys on years of drinking water with too much fluoride.

A lawyer for the residents said the unanimous decision leaves customers of small water systems without protection.

"The government agency's supervisory role is meaningless," said attorney Brian Burchett, whose clients wanted Monterey County held responsible for their health problems. "They're totally at the mercy of the system operator," who in this case, he said, was untrained and uninsured.

Deputy County Counsel Patrick McGreal countered that state law makes water system operators, not public agencies, responsible for notifying customers about contamination.

Although government agencies regulate the water systems and have a duty to maintain water quality, McGreal said, requiring a county to police an operator's customer contacts would impose "open-ended liability."

The ruling applies to the 5,500 water systems in the state that serve fewer than 200 customers. They are regulated by local agencies in 35 counties, including Contra Costa, San Mateo, Marin and Napa, according to state records. The state Department of Public Health oversees small water systems in the other 23 counties. Larger municipal water systems are governed by a separate law.

The suit was filed by people who lived at the 25-trailer Jensen Camp Mobile Home Park in Cachagua from 1995 to 2003. They said the owner, Rick Pinch, who also operated the water system, never told them that his reports to the county showed fluoride content that reached more than four times the safety level.

The county health agency did not order Pinch to fix the system until April 2003, the plaintiffs said. Four months later, Pinch sold the site to two residents, who learned of the contamination and started supplying bottled water to the homes.

The residents' suit against Pinch is still pending. A state appeals court ruled in September 2007 that they could sue the county as well, for allegedly failing to review the reports and tell Pinch to notify them of the contamination, but the state Supreme Court disagreed.

A supervising agency is required under state law to tell a system operator to monitor water quality, but nothing more, Justice Ming Chin said in Monday's ruling.

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## Read the ruling

The ruling in Guzman vs. Monterey County, S157793, can be read at links.sfgate.com/ZHLT

B4 | Wednesday, June 24, 2009 | SAN FRANCISCO CHRONICLE AND SFGATE.COM

www.FluorideAction Network.org

| | | | | |
|---|---|---|---|---|
| Antimony | 0.006 | 0.006 | Increase in blood cholesterol; decrease in blood sugar | Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder |
| Arsenic | 0[7] | 0.010 as of 01/23/06 | Skin damage or problems with circulatory systems, and may have increased risk of getting cancer | Erosion of natural deposits; runoff from orchards, runoff from glass & electronicsproduction wastes |
| Asbestos (fiber >10 micrometers) | 7 million fibers per liter | 7 MFL | Increased risk of developing benign intestinal polyps | Decay of asbestos cement in water mains; erosion of natural deposits |
| Barium | 2 | 2 | Increase in blood pressure | Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits |
| Beryllium | 0.004 | 0.004 | Intestinal lesions | Discharge from metal refineries and coal-burning factories; discharge from electrical, aerospace, and defense industries |
| Cadmium | 0.005 | 0.005 | Kidney damage | Corrosion of galvanized pipes; erosion of natural deposits; discharge from metal refineries; runoff from waste batteries and paints |
| Chromium (total) | 0.1 | 0.1 | Allergic dermatitis | Discharge from steel and pulp mills; erosion of natural deposits |
| Copper | 1.3 | TT[9]; Action Level=1.3 | Short term exposure: Gastrointestinal distress<br>Long term exposure: Liver or kidney damage<br>People with Wilson's Disease should consult their personal doctor if the amount of copper in their water exceeds the action level | Corrosion of household plumbing systems; erosion of natural deposits |
| Cyanide (as free cyanide) | 0.2 | 0.2 | Nerve damage or thyroid problems | Discharge from steel/metal factories; discharge from plastic and fertilizer factories |
| Fluoride | 4.0 | 4.0 | Bone disease (pain and tenderness of the bones); Children may get mottled teeth | Water additive which promotes strong teeth; erosion of natural deposits; discharge |

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Wednesday, September 07, 2011

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# Alzheimer's in America: The Aluminum-Phosphate Fertilizer Connection

**by Lynn Landes**

Americans are losing their minds to Alzheimer's disease. It's an epidemic. And it's not typical of what's going on in the rest of the world.

The World Health Organization (WHO) estimates that there are 18 million people with Alzheimer's. Over 4 1/2 million Americans have the disease. We account for 25% of all Alzheimer's cases, even though we represent only 4.6% of the world's population. Europe is experiencing half our rate of disease. For Americans over 85 years of age, 50% are thought to have Alzheimer□s.

The question is, "Why?"

Alzheimer's was first discovered in 1906. It is not a part of normal aging, says the National Institutes of Health (NIH). The NIH contends that the cause of Alzheimer's is "not known." They say, "Prior theories regarding the accumulation of aluminum, lead, mercury, and other substances in the brain have been disproved."

Don't believe that. Federal agencies have a talent for not finding environmental causes for many diseases. They live by the motto, "Do not seek and thou shall not find." Genetic triggers and lifestyle choices get the research dollars for pretty obvious reasons - their findings don't hurt polluters□ profits.

The world's scientists and government researchers have not taken aluminum off the scientific table as a causal factor in Alzheimer's. Research scientists with the International Aluminum Network report, "Aluminum has been implicated ...as a potential factor or cofactor in the Alzheimer's syndrome, as well as in the etiopathogenesis of other neurodegenerative diseases, Parkinsonism, Amyotrophic Lateral Sclerosis and other diseases." That's a mouthful, but you get the picture.

Initially, it was thought that aluminum might be the sole cause of Alzheimer's. Persons with Alzheimer's have been found to experience increased absorption of aluminum in the brain, as well as exhibit densities of senile plaques and neurofibrillary tangles. However, there are reports that suggest plaques and tangles do not always signify Alzheimer's, and vice versa.

Further clouding the issue are patients on kidney dialysis machines. They are unable to excrete aluminum, plus they may also be treated with medicines that include aluminum. However, reports say that dialysis patients don't develop Alzheimer's, although they can develop dialysis dementia if the equipment doesn't filter out aluminum. And therein lies a clue.

The process of kidney dialysis requires very purified, non-fluoridated water. What does this mean? Perhaps fluoride is aluminum's partner-in-crime.

In 1998 Julie Varner and two colleagues published research on the effects of aluminum-fluoride and sodium-fluoride on the nervous system of rats. They concluded, "Chronic administration of aluminum-fluoride and sodium-fluoride in the drinking water of rats resulted in distinct morphological alterations of the brain, including the effects on neurons and cerebrovasculature." In layman's terms, it looked like fluoride and aluminum could cause Alzheimer's.

That was not a definitive study, but they may have been onto something. Aluminum is in our drinking water, foods, and many consumer products. Adding fluoride to drinking water in the U.S. started in the 1950's. America's drinking water is now over 60% fluoridated. Fluoride appears in many processed foods and beverages made with fluoridated water. Keep in mind, Europe has half our rate of Alzheimer□s. They don't fluoridate their water supplies, but they do use fluoride supplements and dental products. Is there a connection?

There are other intriguing issues. Why do people with thyroid disease have an increased risk for Alzheimer's? In the U.S., thyroid disease has reached even greater epidemic levels than Alzheimer's, with as many as 20 million American victims. Besides problems with iodine intake, a common cause of thyroid disease is radiation.

There are also striking similarities between Alzheimer's, Creutzfeldt-Jacob-Disease (CJD), and mad cow disease. Mad cow has been linked to livestock feed and fertilizer.

So, what do radiation, livestock feed, fluoride, and fertilizer have in common which may have led to the emergence of the Alzheimer□s epidemic? The phosphate fertilizer industry.

"Fertilizer use was not a common practice in the United States until after 1870, when phosphate and lime were applied to crops like cotton and tobacco. By the end of World War II, an era of intensive agriculture began□," says Cargill Fertilizer. "Of the phosphate produced in Florida, about 95% is used in agriculture (90% goes into fertilizer and 5% into livestock feed supplements)." The remaining 5% is used in a variety of foods and beverages, plus personal care, consumer and industrial products.

George Glasser writes in the Earth Island Journal, "Radium wastes from filtration systems at phosphate fertilizer facilities are among the most radioactive types of naturally occurring radioactive material wastes...Uranium and all of its decay-rate products are found in phosphate rock, fluorosilicic acid (fluoride) and phosphate fertilizer."

The Florida Institute of Phosphate Research says, "Removal of uranium as a product is no longer profitable and all of the extraction facilities have been dismantled. The uranium that remains in the phosphoric acid and fertilizer products is at a low enough level that it is safe for use." That's not reassuring. Chronic exposure to low levels of contamination can be as dangerous, or

more so, than chronic high levels of exposure or acute occurrences.

Of particular interest is calcium silicate, another byproduct of the phosphate fertilizer industry. One of its uses is as an anti-caking agent in iodized table salt. Is calcium silicate also radioactive? Would that have a significant impact on the thyroid? Given the relationship between Alzheimer's and thyroid disease, Alzheimer's may be destined to increase exponentially.

The phosphate fertilizer industry seems to be the common thread in Alzheimer's - and maybe also in thyroid and mad cow type diseases. Aluminum by itself may not cause Alzheimer's, but in combination with the radioactive products of the phosphate fertilizer industry, it could be wreaking havoc on our health.

Whatever the cause, we deserve real answers to the Alzheimer's epidemic, not the red herrings of research on genetics and lifestyle. The number of American victims is totally out of proportion to the incidence of Alzheimer's worldwide. Something truly has gone terribly wrong.

*Lynn Landes is a freelance journalist specializing in environmental issues. She writes a weekly column which is published on her website www.EcoTalk.org and reports environmental news for DUTV in Philadelphia, PA. Lynn's been a radio show host and a regular commentator for a BBC radio program.*

Links:

- http://www.bio.unipd.it/~zatta/alumin.htm
- http://www.fluoride-journal.com/98-31-2/31291-95.htm
- http://www.earthisland.org/eijournal/fluoride/fluoride_phosphates.html

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# 50 Reasons to Oppose Fluoridation

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***Updated August, 2011***

By Paul Connett, PhD and other members of the Fluoride Action Network (including James Beck, MD, PhD, Michael Connett, JD, Hardy Limeback, DDS, PhD, David McRae and Spedding Micklem, D.Phil.)

**Introduction**

Fluoridation is the practice of adding a fluoride compound to the public drinking water supply ostensibly for the purpose of fighting tooth decay. The levels used range from 0.6 to 1.2 milligrams of fluoride ion per liter (or parts per million, ppm). The practice began in the U.S. in 1945 and was endorsed by the U.S. Public Health Service (PHS) in 1950. Very few countries have adopted this practice to any significant extent. Only eight countries in the world have more than 50% of their populations drinking artificially fluoridated water (Australia, Colombia, Ireland, Israel, Malaysia, New Zealand, Singapore, and the U.S.). In Europe, only Ireland (with 73% of the population fluoridated), the U.K. (10%) and Spain (10%) fluoridate some of their water supplies. In the U.S., about 70% of the population is drinking fluoridated water – that is approximately 200 million people and about half the number of people drinking artificially fluoridated water worldwide. Some countries have areas with high natural fluoride levels in the water. These include India, China and parts of Africa. In these countries measures are being taken to remove the fluoride because of the health problems that fluoride can cause.

**Fluoridation is a bad medical practice**

1. **Fluoride is the only chemical added to water for the purpose of medical treatment**. The U.S. Food and Drug Administration (FDA) classifies fluoride as a drug when used to prevent or mitigate disease (FDA 2000). As a matter of basic logic, adding fluoride to water for the sole purpose of preventing tooth decay (a non-waterborne disease) is a form of medical treatment. All other water treatment chemicals are added to improve the water's quality or safety, which fluoride does not do.
2. **Fluoridation is unethical**. Informed consent is standard practice for all medication, and one of the key reasons why most of Western Europe has ruled against fluoridation. With water fluoridation we are allowing governments to do to whole communities (forcing people to take a medicine irrespective of their consent) what individual doctors cannot do to individual patients. While referenda are preferential to imposed policies from 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 is against that neighbor's will)?
3. **The dose cannot be controlled**. Once fluoride is put in the water it is impossible to control the dose each individual receives because people drink different amounts of water. Being able to control the dose a patient receives is critical. Some people (e.g., manual laborers, athletes, diabetics, and people with kidney disease) drink substantially more water than others.
4. **The fluoride goes to everyone regardless of age, health or vulnerability.** According to Dr. Arvid Carlsson, the 2000 Nobel Laureate in Medicine and Physiology and one of the scientists who helped keep fluoridation out of Sweden:

   > "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).

5. **People now receive fluoride from many other sources besides water.** Fluoridated water is not the only way people are exposed to fluoride. Other sources of fluoride include food and beverages processed with fluoridated water (Kiritsy 1996; Heilman 1999), fluoridated dental products (Bentley 1999; Levy 1999), mechanically deboned meat (Fein 2001), tea (Levy 1999), and pesticide residues (e.g., from cryolite) on food (Stannard 1991; Burgstahler 1997). It is now widely acknowledged that exposure to non-water sources of fluoride has significantly increased since the water fluoridation program first began (NRC 2006).
6. **Fluoride is not an essential nutrient** (National Research Council [NRC] 1993; Institute of Medicine [IOM] 1997, NRC 2006). No disease has ever been linked to a fluoride deficiency. It has never been shown that ingested fluoride is needed to produce decay-free teeth. Not a single biological process has been shown to require fluoride. On the contrary there is extensive evidence that fluoride can interfere with many important biological processes. Fluoride interferes with numerous enzymes (Waldbott 1978). In combination with aluminum, fluoride interferes with G-proteins (Bigay 1985, 1987). Such interactions give aluminum-fluoride complexes the potential to interfere with signals from growth factors, hormones and neurotransmitters

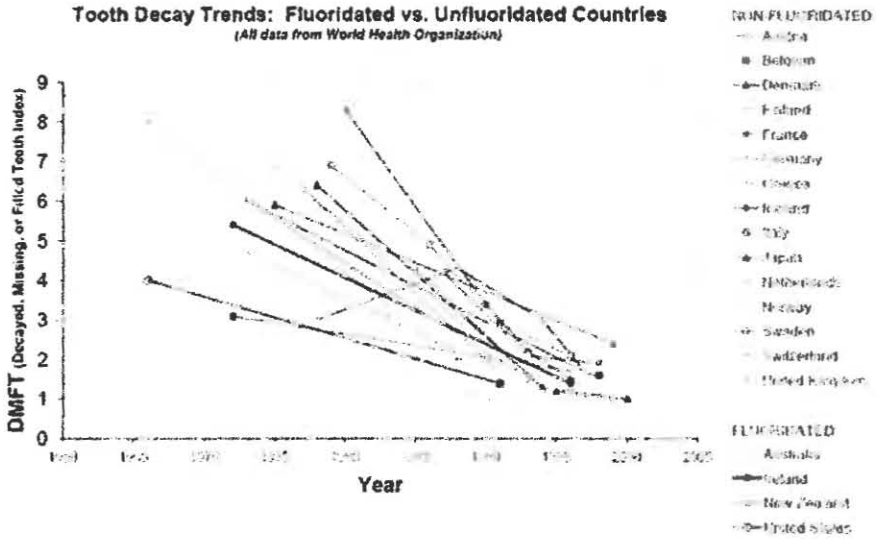
(Strunecka & Patocka 1999; Li 2003). More and more studies are indicating that fluoride can interfere with biochemistry in fundamental ways (Barbier 2010).

7. **The level in mothers' milk is very low**. Considering reason #6 it is perhaps not surprising that the level of fluoride in mother's milk is remarkably low (0.004 ppm, NRC, 2006). This means that a bottle-fed baby consuming fluoridated water (0.6 – 1.2 ppm) can get up to 300 times more fluoride than a breast-fed baby. There are no benefits (see reasons #11-19), only risks (see reasons #21-36), for infants ingesting this heightened level of fluoride at such an early age (an age where susceptibility to environmental toxins is particularly high).
8. **Fluoride accumulates in the body**. Healthy adult kidneys excrete 50 to 60% of the fluoride they ingest each day (Marier & Rose 1971). The remainder accumulates in the body, largely in calcifying tissues such as the bones and pineal gland (Luke 1997, 2001). Infants and children excrete less fluoride from their kidneys and take up to 80% of ingested fluoride into their bones (Ekstrand 1994). The fluoride concentration in bone steadily increases over a lifetime (NRC 2006).
9. **No health agency in fluoridated countries is monitoring fluoride exposure or side effects**. No regular measurements are being made of the levels of fluoride in urine, blood, bones, hair, or nails of either the general population or sensitive subparts of the population (e.g., individuals with kidney disease).
10. **There has never been a single randomized clinical trial to demonstrate fluoridation's effectiveness or safety**. Despite the fact that fluoride has been added to community water supplies for over 60 years, "there have been no randomized trials of water fluoridation" (Cheng 2007). Randomized studies are the standard method for determining the safety and effectiveness of any purportedly beneficial medical treatment. In 2000, the British Government's "York Review" could not give a single fluoridation trial a Grade A classification – despite 50 years of research (McDonagh 2000). The U.S. Food and Drug Administration (FDA) continues to classify fluoride as an "unapproved new drug."

**Swallowing fluoride provides no (or very little) benefit**

11. **Benefit is topical not systemic.** The Centers for Disease Control and Prevention (CDC, 1999, 2001) has now acknowledged that the mechanism of fluoride's benefits are mainly topical, not systemic. There is no need whatsoever, therefore, to swallow fluoride to protect teeth. Since the purported benefit of fluoride is topical, and the risks are systemic, it makes more sense to deliver the fluoride directly to the tooth in the form of toothpaste. Since swallowing fluoride is unnecessary, and potentially dangerous, there is no justification for forcing people (against their will) to ingest fluoride through their water supply.
12. **Fluoridation is not necessary.** Most western, industrialized countries have rejected water fluoridation, but have nevertheless experienced the same decline in childhood dental decay as fluoridated countries. (See data from World Health Organization presented graphically in Figure 1).

Figure 1.




13. **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 their entire lives in either fluoridated or unfluoridated areas (Brunelle & Carlos, 1990). This difference is less than one tooth surface, and less than 1% of the 100+ tooth surfaces available in a child's mouth. Large surveys from three Australian states have found even less of a benefit, with decay reductions ranging from 0 to 0.3 of one permanent tooth surface (Spencer 1996; Armfield & Spencer 2004). None of these studies have allowed for the possible delayed eruption of the teeth that may be caused by exposure to fluoride, for which there is some evidence (Komarek 2005). A one-year delay in eruption of the permanent teeth would eliminate the very small benefit recorded in these modern studies.
14. **NIH-funded study on individual fluoride ingestion and tooth decay failed to find a significant correlation**. A multi-million dollar, U.S. National Institutes of Health (NIH) -funded study (Warren 2009) found no relation between tooth decay and the

amount of fluoride ingested by children. This is the first time that tooth decay has been investigated as a function of individual exposure as opposed to mere residence in a fluoridated community.

15. **Tooth decay is high in low-income communities that have been fluoridated for years.** Despite some claims to the contrary, water fluoridation cannot prevent the oral health crises that result from rampant poverty, inadequate nutrition, and lack of access to dental care. There have been numerous reports of severe dental crises in low-income neighborhoods of US cities that have been fluoridated for over 20 years (e.g., Boston, Cincinnati, New York City, and Pittsburgh). In addition, fluoridation has been repeatedly found to be ineffective at preventing the most serious oral health problem facing poor children, namely "baby bottle tooth decay," otherwise known as early childhood caries (Barnes 1992; Shiboski 2003).

16. **Tooth decay does not go up when fluoridation is stopped.** Where fluoridation has been discontinued in communities from Canada, the former East Germany, Cuba and Finland, dental decay has not increased but has generally continued to decrease (Maupomé 2001; Kunzel & Fischer, 1997, 2000; Kunzel 2000; Seppa 2000).

17. **Tooth decay was coming down before fluoridation started.** Modern research (e.g., Diesendorf 1986; Colquhoun 1997) shows that decay rates were coming down before fluoridation was introduced in Australia and New Zealand and have continued to decline even after its benefits would have been maximized (see Figure 2). Many other factors influence tooth decay.

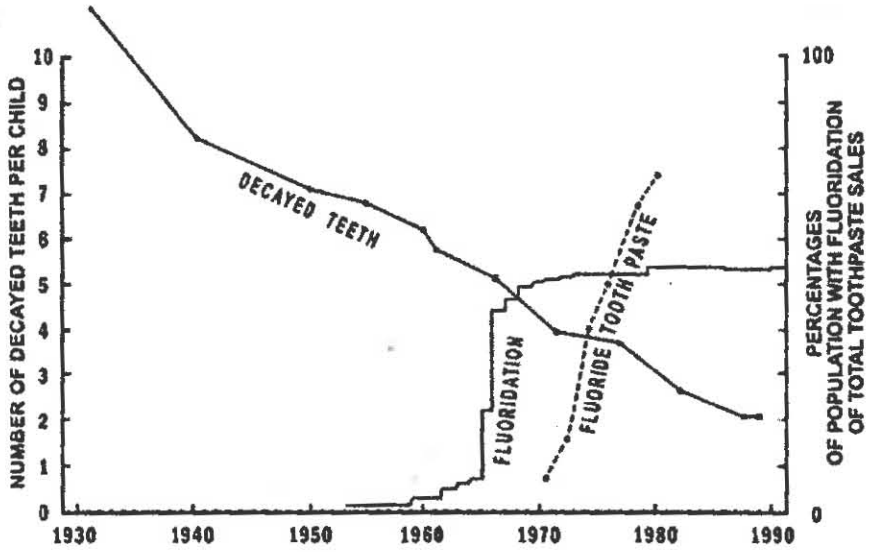



**Figure 2.** The number of decayed teeth in 5-year olds in New Zealand, over the period 1930-1990. The percentage of the population drinking fluoridated water and the percentage of the total toothpaste sold containing fluoride are shown on the right hand axis (Colquhoun, 1993).

18. **The studies that launched fluoridation were methodologically flawed.** The early trials conducted between 1945 and 1955 in North America that helped to launch fluoridation, have been heavily criticized for their poor methodology and poor choice of control communities (De Stefano 1954; Sutton 1959, 1960, 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." Serious questions have also been raised about Trendley Dean's (the father of fluoridation) famous 21-city study from 1942 (Ziegelbecker 1981).

**Children are being over-exposed to fluoride**

19. **Children are being over-exposed to fluoride.** The fluoridation program has massively failed to achieve one of its key objectives, i.e., to lower dental decay rates while limiting the occurrence of dental fluorosis (a discoloring of tooth enamel caused by too much fluoride. The goal of the early promoters of fluoridation was to limit dental fluorosis (in its very mild form) to 10% of children (NRC 1993, pp. 6-7). In 2010, however, the Centers for Disease Control and Prevention (CDC) reported that 41% of American adolescents had dental fluorosis, with 8.6% having mild fluorosis and 3.6% having either moderate or severe dental fluorosis (Beltran-Aguilar 2010). As the 41% prevalence figure is a national average and includes children living in fluoridated and unfluoridated areas, the fluorosis rate in fluoridated communities will obviously be higher. The British Government's York Review estimated that up to 48% of children in fluoridated areas worldwide have dental fluorosis in all forms, with 12.5% having fluorosis of aesthetic concern (McDonagh, 2000).

20. **The highest doses of fluoride are going to bottle-fed babies.** Because of their sole reliance on liquids for their food intake, infants consuming formula made with fluoridated water have the highest exposure to fluoride, by bodyweight, in the population. Because infant exposure to fluoridated water has been repeatedly found to be a major risk factor for developing dental fluorosis later in life (Marshall 2004; Hong 2006; Levy 2010), a number of dental researchers have recommended that parents of newborns not use fluoridated water when reconstituting formula (Ekstrand 1996; Pendrys 1998; Fomon 2000; Brothwell 2003;

Marshall 2004). Even the American Dental Association (ADA), the most ardent institutional proponent of fluoridation, distributed a November 6, 2006 email alert to its members recommending that parents be advised that formula should be made with "low or no-fluoride water." Unfortunately, the ADA has done little to get this information into the hands of parents. As a result, many parents remain unaware of the fluorosis risk from infant exposure to fluoridated water.

**Evidence of harm to other tissues**

21. **Dental fluorosis may be an indicator of wider systemic damage.** There have been many suggestions as to the possible biochemical mechanisms underlying the development of dental fluorosis (Matsuo 1998; Den Besten 1999; Sharma 2008; Duan 2011; Tye 2011) and they are complicated for a lay reader. While promoters of fluoridation are content to dismiss dental fluorosis (in its milder forms) as merely a cosmetic effect, it is rash to assume that fluoride is not impacting other developing tissues when it is visibly damaging the teeth by some biochemical mechanism (Groth 1973; Colquhoun 1997). Moreover, ingested fluoride can only cause dental fluorosis during the period before the permanent teeth have erupted (6-8 years), other tissues are potentially susceptible to damage throughout life. For example, in areas of naturally high levels of fluoride the first indicator of harm is dental fluorosis in children. In the same communities many older people develop skeletal fluorosis.

22. **Fluoride may damage the brain.** According to the National Research Council (2006), "it is apparent that fluorides have the ability to interfere with the functions of the brain." In a review of the literature commissioned by the US Environmental Protection Agency (EPA), fluoride has been listed among about 100 chemicals for which there is "substantial evidence of developmental neurotoxicity." Animal experiments show that fluoride accumulates in the brain and alters mental behavior in a manner consistent with a neurotoxic agent (Mullenix 1995). In total, there have now been over 100 animal experiments showing that fluoride can damage the brain and impact learning and behavior. According to fluoridation proponents, these animal studies can be ignored because high doses were used. However, it is important to note that it takes 5-20 times more fluoride to reach the same plasma levels in rats as reached in humans (Sawan 2010). In fact, one animal experiment found effects at remarkably low doses (Varner 1998). In this study, rats fed for one year with 1 ppm fluoride in their water (the same level used in fluoridation programs), 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 associated with Alzheimer's disease. Other animal studies have found effects on the brain at water fluoride levels as low as 5 ppm (Liu 2010). (For a complete listing of these studies.

23. **Fluoride may lower IQ.** There have now been 24 studies from China, Iran, India and Mexico that have reported an association between fluoride exposure and reduced IQ. 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. In the absence of iodine deficiency, another research team (Xiang 2003a,b) estimated that fluoride may lower IQ at 1.9 ppm, while a recent preliminary study (Ding 2011) found a lowering of IQ in children drinking water at levels ranging from 0.3 to 3 ppm. The authors of this latter study reported that for each increase of 1 ppm fluoride measured in the urine there was a loss of 0.59 IQ points. None of these studies indicates an adequate margin of safety to protect all children drinking artificially fluoridated water from this affect. According to the National Research Council (2006), "the consistency of the results [in fluoride/IQ studies] appears significant enough to warrant additional research on the effects of fluoride on intelligence." Except for an early and small IQ study from New Zealand (Shannon et al., 1986) no fluoridating country has investigated the matter for themselves.

24. **Fluoride may cause non-IQ neurotoxic effects.** Reduced IQ is not the only neurotoxic effect that may result from fluoride exposure. At least three human studies have reported an association between fluoride exposure and impaired visual-spatial organization (Calderon 2000; Li 2004; Rocha-Amador 2009); while three other studies have found an association between prenatal fluoride exposure and fetal brain damage (Han 1989; Du 1992; Yu 1996).

25. **Fluoride affects the pineal gland.** Studies by Jennifer Luke (2001) show 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). Consistent with Luke's findings, one of the earliest fluoridation trials in the U.S. (Schlesinger 1956) reported that on average young girls in the fluoridated community reached menstruation 5 months earlier than girls in the non-fluoridated community. Inexplicably, no fluoridating country has attempted to reproduce either Luke's or Schlesinger's findings or examine the issue any further.

26. **Fluoride affects thyroid function.** According to the U.S. National Research Council (2006), "several lines of information indicate an effect of fluoride exposure on thyroid function." In the Ukraine, Bachinskii (1985) found a lowering of thyroid function, among otherwise healthy people, at 2.3 ppm fluoride in water. In the middle 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 (overactive thyroid) (Stecher 1960; Waldbott 1978). According to a clinical study by Galletti and Joyet (1958), the thyroid function of hyperthyroid patients was effectively reduced at just 2.3 to 4.5 mg/day of fluoride ion. To put this finding in perspective, the Department of Health and Human Services (DHHS, 1991) has estimated that total fluoride exposure in fluoridated communities ranges from 1.6 to 6.6 mg/day. This is a remarkable fact, particularly considering the rampant and increasing problem of hypothyroidism (underactive thyroid) in the United States and other fluoridated countries. Symptoms of hypothyroidism include depression, fatigue, weight gain, muscle and joint pains, increased cholesterol levels, and heart disease. In 2010, the second most prescribed drug of the year was Synthroid (sodium levothyroxine) which is a hormone replacement drug used to treat an underactive thyroid.

27. **Fluoride causes arthritic symptoms.** 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 published in 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) and other fluoridated countries is related to growing fluoride exposure, which is highly plausible. Even when individuals in

the U.S. suffer advanced forms of skeletal fluorosis (from drinking large amounts of tea), it has taken years of misdiagnoses before doctors finally correctly diagnosed the condition as fluorosis.

28. **Fluoride damages bone.** An early fluoridation trial (Newburgh-Kingston 1945-55) found a significant two-fold increase in cortical bone defects among children in the fluoridated community (Schlesinger 1956). The cortical bone is the outside layer of the bone and is important to protect against fracture. While this result was not considered important at the time with respect to bone fractures, it did prompt questions about a possible link to osteosarcoma (Caffey, 1955; NAS, 1977). In 2001, Alarcon-Herrera and co-workers reported a linear correlation between the severity of dental fluorosis and the frequency of bone fractures in both children and adults in a high fluoride area in Mexico.

29. **Fluoride may increase hip fractures in the elderly.** 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). Hip fracture is a very serious issue for the elderly, often leading to a loss of independence or a shortened life. There have been over a dozen studies published since 1990 that have investigated a possible relationship between hip fractures and long term consumption of artificially fluoridated water or water with high natural levels. The results have been mixed – some have found an association and others have not. Some have even claimed a protective effect. One very important study in China, which examined hip fractures in six Chinese villages, found what appears to be a dose-related increase in hip fracture as the concentration of fluoride rose from 1 ppm to 8 ppm (Li 2001) offering little comfort to those who drink a lot of fluoridated water. Moreover, in the only human epidemiological study to assess bone strength as a function of bone fluoride concentration, researchers from the University of Toronto found that (as with animal studies) the strength of bone declined with increasing fluoride content (Chachra 2010). Finally, a recent study from Iowa (Levy 2009), published data suggesting that low-level fluoride exposure may have a detrimental effect on cortical bone density in girls (an effect that has been repeatedly documented in clinical trials and which has been posited as an important mechanism by which fluoride may increase bone fracture rates).

30. **People with impaired kidney function are particularly vulnerable to bone damage.** Because of their inability to effectively excrete fluoride, people with kidney disease are prone to accumulating high levels of fluoride in their bone and blood. As a result of this high fluoride body burden, kidney patients have an elevated risk for developing skeletal fluorosis. In one of the few U.S. studies investigating the matter, crippling skeletal fluorosis was documented among patients with severe kidney disease drinking water with just 1.7 ppm fluoride (Johnson 1979). Since severe skeletal fluorosis in kidney patients has been detected in small case studies, it is likely that larger, systematic studies would detect skeletal fluorosis at even lower fluoride levels

31. **Fluoride may cause bone cancer (osteosarcoma).** A U.S. government-funded animal study found a dose-dependent increase in bone cancer (osteosarcoma) in fluoride-treated, male rats (NTP 1990). Following the results of this study, the National Cancer Institute (NCI) reviewed national cancer data in the U.S. and found a significantly higher rate of osteosarcoma (a bone cancer) in young men in fluoridated versus unfluoridated areas (Hoover et al 1991a). While the NCI concluded (based on an analysis lacking statistical power) that fluoridation was not the cause (Hoover et al 1991b), no explanation was provided to explain the higher rates in the fluoridated areas. A smaller study from New Jersey (Cohn 1992) found osteosarcoma rates to be up to 6 times higher in young men living in fluoridated versus unfluoridated areas. Other epidemiological studies of varying size and quality have failed to find this relationship (a summary of these can be found in Bassin, 2001 and Connett & Neurath, 2005). There are three reasons why a fluoride-osteosarcoma connection is plausible: First, fluoride accumulates to a high level in bone. Second, fluoride stimulates bone growth. And, third, fluoride can interfere with the genetic apparatus of bone cells in several ways; it has been shown to be mutagenic, cause chromosome damage, and interfere with the enzymes involved with DNA repair in both cell and tissue studies (Tsutsui 1984; Caspary 1987; Kishi 1993; Mihashi 1996; Zhang 2009). In addition to cell and tissue studies, a correlation between fluoride exposure and chromosome damage in humans has also been reported (Sheth 1994; Wu 1995; Meng 1997; Joseph 2000).

32. **Proponents have failed to refute the Bassin-Osteosarcoma study.** In 2001, Elise Bassin, a dentist, successfully defended her doctoral thesis at Harvard in which she found that young boys had a five-to-seven fold increased risk of getting osteosarcoma by the age of 20 if they drank fluoridated water during their mid-childhood growth spurt (age 6 to 8). The study was published in 2006 (Bassin 2006) but has been largely discounted by fluoridating countries because her thesis adviser Professor Chester Douglass (a promoter of fluoridation and a consultant for Colgate) promised a larger study that he claimed would discount her thesis (Douglass and Joshipura, 2006). Now, after 5 years of waiting the Douglass study has finally been published (Kim 2011) but in no way does this study discount Bassin's findings. The study, which used far fewer controls than Bassin's analysis, did not even attempt to assess the age-specific window of risk that Bassin identified. Indeed, by the authors' own admission, the study had no capacity to assess the risk of osteosarcoma among children and adolescents (the precise population of concern). For a critique of the Douglass study, click here.

33. **Fluoride may cause reproductive problems.** 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; Zakrzewska 2002). In addition, an epidemiological study from the US found increased rates of infertility among couples living in areas with 3 ppm or more fluoride in the water (Freni 1994), two studies have found reduced level of circulating testosterone in males living in high fluoride areas (Susheela 1996; Barot 1998), and a study of fluoride-exposed workers reported a "subclinical reproductive effect" (Ortiz-Perez 2003). While animal studies by FDA researchers have failed to find evidence of reproductive toxicity in fluoride-exposed rats (Sprando 1996, 1997, 1998), the National Research Council (2006) has recommended that, "the relationship between fluoride and fertility requires additional study."

34. **Some individuals are highly sensitive to low levels of fluoride** as shown by case studies and double blind studies (Shea 1967; Waldbott 1978; Moolenburgh 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. Many individuals have reported suffering from symptoms such as fatigue, headaches, rashes and stomach and gastro intestinal tract problems, which disappear when they

avoid fluoride in their water and diet. Frequently the symptoms reappear when they are unwittingly exposed to fluoride again (Spittle, 2008). No fluoridating government has conducted scientific studies to take this issue beyond these anecdotal reports. Without the willingness of governments to investigate these reports scientifically, should we as a society be forcing these people to ingest fluoride?

35. **Other subsets of population are more vulnerable to fluoride's toxicity.** In addition to people suffering from impaired kidney function discussed in reason #30 other subsets of the population are more vulnerable to fluoride's toxic effects. According to the Agency for Toxic Substances and Disease Registry (ATSDR 1993) these include: infants, the elderly and diabetics. Also vulnerable are those who suffer from malnutrition (e.g., calcium, magnesium, vitamin C, vitamin D and iodine deficiencies and protein-poor diets. See: Massler & Schour 1952; Marier & Rose 1977; Lin Fa-Fu 1991; Chen 1997; Teotia 1998).

**No Margin of Safety**

36. **There is no margin of safety for several health effects.** No one can deny that high natural levels of fluoride damage health. Millions of people in India and China have had their health compromised by fluoride. The real argument is about whether there is an adequate margin of safety between the doses that have been shown to cause harm in published studies and the total dose people receive consuming uncontrolled amounts of fluoridated water and non-water sources of fluoride. This margin of safety has to take into account the wide range of individual sensitivity expected in a large population (a safety factor of 10 is usually applied to the lowest level causing harm). Another safety factor is also needed to take into account the wide range of doses to which people are exposed. There is clearly no margin of safety for dental fluorosis (CDC, 2010) and based on the following studies nowhere near an adequate margin of safety for lowered IQ (Xiang 2003a,b; Ding 2011); lowered thyroid function (Galletti & Joyet 1958; Bachinskii 1985; Lin 1991); bone fractures in children (Alarcon-Herrera 2001) or hip fractures in the elderly (Kurttio 1999; Li 2001). All these harmful effects are discussed in the NRC (2006) review.

**Environmental Justice**

37. **Low-income families penalized by fluoridation.** Those most likely to suffer from poor nutrition, and thus more likely to be more vulnerable to fluoride's toxic effects, are the poor, who unfortunately, are the very people being targeted by new fluoridation programs. While at heightened risk, poor families are least able to afford avoiding fluoride once it is added to the water supply. No financial support is being offered to these families to help them get alternative water supplies or to help pay the costs of treating unsightly cases of dental fluorosis.

38. **Black and Hispanic children are more vulnerable to fluoride's toxicity.** According to the CDC's national survey of dental fluorosis, black and Mexican-American children have significantly higher rates of dental fluorosis than white children (Beltran-Aguilar 2005, Table 23). The recognition that minority children appear to be more vulnerable to toxic effects of fluoride, combined with the fact that low-income families are less able to avoid drinking fluoridated water, has prompted prominent leaders in the environmental-justice movement to oppose mandatory fluoridation in Georgia. In a statement issued in May 2011, the Rev. Andrew Young, a colleague of Martin Luther King, Jr., and former Mayor of Atlanta and former US Ambassador to the United Nations, stated:

> "I am most deeply concerned for poor families who have babies: if they cannot afford unfluoridated water for their babies' milk formula, do their babies not count? Of course they do. This is an issue of fairness, civil rights, and compassion. We must find better ways to prevent cavities, such as helping those most at risk for cavities obtain access to the services of a dentist... My father was a dentist. I formerly was a strong believer in the benefits of water fluoridation for preventing cavities. But many things that we began to do 50 or more years ago we now no longer do, because we have learned further information that changes our practices and policies. So it is with fluoridation." (see: http://www2.fluoridealert.org/Alert/United-States/Georgia/Atlanta-Civil-Rights-Leaders-Callfor- Halt-to-Water-Fluoridation)

39. **Minorities are not being warned about their vulnerabilities to fluoride.** The CDC is not warning black and Mexican-American children that they have higher rates of dental fluorosis than Caucasian children (see #38). This extra vulnerability may extend to other toxic effects of fluoride. Black Americans have higher rates of lactose intolerance, kidney problems and diabetes, all of which may exacerbate fluoride's toxicity.

40. **Tooth decay reflects low-income not low-fluoride intake.** Since dental decay is most concentrated in poor communities, we should be spending our efforts trying to increase the access to dental care for low-income families. The highest rates of tooth decay today can be found in low-income areas that have been fluoridated for many years. 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.

**The largely untested chemicals used in fluoridation programs**

41. **The chemicals used to fluoridate water are not pharmaceutical grade.** Instead, they largely come from the wet scrubbing systems of the phosphate 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 silicon fluorides are relatively high (up to 1.6 ppb after dilution into public water) and of potential concern (NSF 2000 and Wang 2000). Arsenic is a known human carcinogen for which there is no safe level. This one contaminant alone could be increasing cancer rates – and unnecessarily so.

42. **The silicon fluorides have not been tested comprehensively.** The chemical usually tested in animal studies is pharmaceutical grade sodium fluoride, not industrial grade fluorosilicic acid. Proponents claim that once the silicon fluorides have been diluted at the public water works they are completely dissociated to free fluoride ions and hydrated silica and thus

there is no need to examine the toxicology of these compounds. However, while a study from the University of Michigan (Finney et al., 2006) showed complete dissociation at neutral pH, in acidic conditions (pH 3) there was a stable complex containing five fluoride ions. Thus the possibility arises that such a complex may be regenerated in the stomach where the pH lies between 1 and 2.

43. **The silicon fluorides may increase lead uptake into children's blood.** Studies by Masters and Coplan 1999, 2000, 2007 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 developing brain, this is a very serious finding. Nevertheless, it is being largely ignored by fluoridating countries. This association received some strong biochemical support from an animal study by Sawan et al. (2010) who found that exposure of rats to a combination of fluorosilicic acid and lead in their drinking water increased the uptake of lead into blood some threefold over exposure to lead alone.

44. **Fluoride may leach lead from pipes, brass fittings and soldered joints.** Maas et al (2007) have shown that fluoridating agents in combination with chlorinating agents such as chloroamine increase the leaching of lead from brass fittings used in plumbing. While proponents may argue about the neurotoxic effects of low levels of fluoride there is no argument that lead at very low levels lowers IQ in children.

**Continued promotion of fluoridation is unscientific**

45. **Key health studies have not been done**. In the January 2008 issue of Scientific American, Professor John Doull, the chairman of the important 2006 National Research Council review, Fluoride in Drinking Water: A Review of EPA's Standards, is quoted as saying:

> What the committee found is that we've gone with the status quo regarding fluoride for many years—for too long really—and now we need to take a fresh look . . . In the scientific community people tend to think this is settled. I mean, when the U.S. surgeon general comes out and says this is one of the top 10 greatest achievements of the 20th century, that's a hard hurdle to get over. But when we looked at the studies that have been done, we found that many of these questions are unsettled and we have much less information than we should, considering how long this [fluoridation] has been going on.

The absence of studies is being used by promoters as meaning the absence of harm. This is an irresponsible position.

46. **Endorsements do not represent scientific evidence.** Many of those promoting fluoridation rely heavily on a list of endorsements. However, the U.S. PHS first endorsed fluoridation in 1950, before one single trial had been completed and before any significant health studies had been published (see chapters 9 and 10 in *The Case Against Fluoride* for the significance of this PHS endorsement for the future promotion of fluoridation). Many other endorsements swiftly followed with little evidence of any scientific rational for doing so. The continued use of these endorsements has more to do with political science than medical science.

47. **Review panels hand-picked to deliver a pro-fluoridation result.** Every so often, particularly when their fluoridation program is under threat, governments of fluoridating countries hand-pick panels to deliver reports that provide the necessary re-endorsement of the practice.

In their recent book Fluoride Wars (2009), which is otherwise slanted toward fluoridation, Alan Freeze and Jay Lehr concede this point when they write:

> There is one anti-fluoridationist charge that does have some truth to it. Anti-fluoride forces have always claimed that the many government-sponsored review panels set up over the years to assess the costs and benefits of fluoridation were stacked in favor of fluoridation. A review of the membership of the various panels confirms this charge. The expert committees that put together reports by the American Association for the Advancement of Science in 1941, 1944 and 1954; the National Academy of Sciences in 1951, 1971, 1977 and 1993; the World Health Organization in 1958 and 1970; and the U.S. Public Health Service in 1991 are rife with the names of well-known medical and dental researchers who actively campaigned on behalf of fluoridation or whose research was held in high regard in the pro-fluoridation movement. Membership was interlocking and incestuous.

The most recent examples of these self-fulfilling prophecies have come from the Irish Fluoridation Forum (2002); the National Health and Medical Research Council (NHMRC, 2007) and Health Canada (2008, 2010). The latter used a panel of six experts to review the health literature. Four of the six were pro-fluoridation dentists and the other two had no demonstrated expertise on fluoride. A notable exception to this trend was the appointment by the U.S. National Research Council of the first balanced panel of experts ever selected to look at fluoride's toxicity in the U.S. This panel of twelve reviewed the US EPA's safe drinking water standards for fluoride. After three and half years the panel concluded in a 507- page report that the safe drinking water standard was not protective of health and a new maximum contaminant level goal (MCLG) should be determined (NRC, 2006). If normal toxicological procedures and appropriate margins of safety were applied to their findings this report should spell an end to water fluoridation. Unfortunately in January of 2011 the US EPA Office of Water made it clear that they would not determine a value for the MCLG that would jeopardize the water fluoridation program (EPA press release, Jan 7, 2011. Once again politics was allowed to trump science.

**More and more independent scientists oppose fluoridation**

48. **Many scientists oppose fluoridation.** Proponents of fluoridation have maintained for many years— despite the fact that the earliest opponents of fluoridation were biochemists—that the only people opposed to fluoridation are not bona fide scientists. Today, as more and more scientists, doctors, dentists and other professionals, read the primary literature for themselves, rather than relying on self-serving statements from the ADA and the CDC, they are realizing that they and the general public have not been diligently informed by their professional bodies on this subject. As of July 2011, over 3700 professionals have signed a statement calling for an end to water fluoridation worldwide. This statement and a list of signatories can be found on the

website of the Fluoride Action Network (see: www.FluorideAlert.org). A glimpse of the caliber of those opposing fluoridation can be gleaned by watching the 28-minute video "Professional Perspectives on Water fluoridation" which can be viewed online at the same FAN site.

**Proponents' dubious tactics**

49. **Proponents usually refuse to defend fluoridation in open debate.** While pro-fluoridation officials continue to promote fluoridation with undiminished fervor, they usually refuse to 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 U.S. EPA (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" (Easley, 1999). 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).

50. **Proponents use very dubious tactics to promote fluoridation.** Many scientists, doctors and dentists who have spoken out publicly on this issue have been subjected to censorship and intimidation (Martin 1991). 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 (Mullenix 1995); and Dr. William Marcus was fired from the EPA for questioning the government's handling of the NTP's fluoride-cancer study (Bryson 2004). Many dentists and even doctors tell opponents in private that they are opposed to this practice but dare not speak out in public because of peer pressure and the fear of recriminations. Tactics like this would not be necessary if those promoting fluoridation were on secure scientific and ethical grounds.

**Conclusion**

When it comes to controversies surrounding toxic chemicals, vested 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 sixty-year delay. Unfortunately, because government officials and dental leaders 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.

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?

While fluoridation may not be the greatest environmental health threat, it is one of the easiest to end. It is as easy as turning off a spigot in the public water works. But to turn off that spigot takes political will and to get that we need masses more people informed and organized. Please get these 50 reasons to all your friends and encourage them to get fluoride out of their community and to help ban this practice worldwide.

**Postscript**

Further arguments against fluoridation, can be viewed at http://www.fluoridealert.org and in the book The Case Against Fluoridation (Chelsea Green, 2010). Arguments for fluoridation can be found at http://www.ada.org

**Publication history of the 50 Reasons**

These 50 Reasons were first compiled by Paul Connett and presented in person to the Fluoridation Forum in Ireland in October 2000. The document was refined in 2004 and published in *Medical Veritas*. See: http://www.fluoridealert.org/50reasons.htm In the introduction to this 2004 version it was explained that after over four years the Irish authorities had not been able to muster a response to the 50 Reasons, despite agreeing to do so in 2000. Eventually, an anonymous, incomplete and superficial response was posted on the Irish Department of Health and Children's website (see this response and addendum at: http://www.dohc.ie/other_health_issues/dental_research/. Paul Connett's comprehensive response to this response can be accessed at http://www.fluoridealert.org/50reasons.htm We learned on August 7, 2011 that this governmental response was prepared by an external contractor at a cost to the Irish taxpayers' of over 30,000 Euros. See: http://www.independent.ie/national-news/staggering-sums-spent-on-reportscommissioned- by-the-state-2841922.html Since 2004, there have been many major scientific developments including the publication of the U.S. National Research Council report (NRC, 2006); the publication of Bassin's study on Osteosarcoma (Bassin 2006), and many more studies of fluoride's interaction with the brain, that have necessitated a major update of the 50 Reasons. This was compiled in August 2011.

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**Fluoride Dangers**

Sources of Fluoride
Dental Fluorosis
Other Risks of Fluoride
Fluoride's Benefits?

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FLUORIDE ACTION NETWORK



# Top Ten Arguments Against Water Fluoridation

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1. **Fluoridation is a violation of the individual's right to informed consent to medication.**
2. **Fluoride is not an essential nutrient.** No biological process in animals or humans has been shown to depend on it. On the contrary, it is known that fluoride can interfere with many important biological processes and vital cellular constituents, such as enzymes and G-proteins. This makes fluoride potentially toxic even at low doses.
3. **Children in fluoridated countries are greatly over-exposed to fluoride.** When fluoridation began in 1940s, 10% of children were expected to develop dental fluorosis (damage to the enamel involving discoloration and/or mottling) in its very mild form. Today, the prevalence in fluoridated countries is much higher—41% of all American children aged 12-15 are now impacted with some form of dental fluorosis (CDC, 2010), with over 10% in categories (mild, moderate and severe) that may need expensive treatment.
4. **The chemicals used to fluoridate water supplies are largely hazardous by-products of the fertilizer industry.** These chemicals cannot be disposed of into the sea by international law, and have never been required to undergo randomized clinical trials for safety or effectiveness by any regulatory agency in the world. The U.S. FDA classifies fluoride as an "unapproved drug."
5. **There is mounting evidence that swallowing fluoride causes harm.** Fluoride has been found to damage soft tissues (brain, kidneys, and endocrine system), as well as teeth (dental fluorosis) and bones (skeletal fluorosis). There are now 24 studies that show a relationship between fairly modest exposure to fluoride and reduced IQ in children. Two of these studies suggest that the threshold for damage may be reached at fluoride levels similar to those used in water fluoridation.
6. **Swallowing fluoride provides little or no benefit to the teeth.** Even promoters of fluoridation agree that fluoride works topically (on the outer surface of the teeth), and not via some internal biological mechanism (CDC, 1999). A recent U.S. study found no relationship between the amount of fluoride a child ingested and level of tooth decay (Warren et al., 2009). Topical treatment in the form of fluoridated toothpaste is universally available, so it is a mistake to swallow fluoride and expose all the tissues of the body to its harmful effects.
7. **Human breast milk is very low in fluoride.** Breast milk averages only 0.007 ppm F (NRC, 2006). Even in areas with high fluoride levels, nursing children receive only a small fraction of the mother's fluoride intake, ensuring that the sensitive brains and bodies of breast-fed infants are protected from the developmental effects of this toxin. In contrast, a bottle-fed baby in a fluoridated area (0.7-1.2 ppm F) gets up to 200 times more fluoride than a breast-fed baby, resulting in an increased risk of dental fluorosis and other adverse effects.
8. **Once fluoride is added to water, there is no way to control who gets the drug or how much is ingested.** No medical follow-up or monitoring of fluoride levels in citizens' urine or bones is being carried-out by health agencies and so no record is being kept of adverse effects or daily or accumulated exposures.
9. **Certain subgroups are particularly affected by fluoridation.** People vary considerably in their sensitivity to any toxic substance, including fluoride. Infants, the elderly, diabetics, those with poor nutrition (e.g. low calcium and low iodine), and those with kidney disease are especially vulnerable to specific adverse effects of fluoride. Black and Mexican-Americans have a higher prevalence of the more severe forms of dental fluorosis (see Table 23, CDC, 2005).
10. **Fluoridation discriminates against those with low incomes.** People on low incomes are least able to afford avoidance measures (reverse osmosis or bottled water), or treatment of dental fluorosis (see Point 3) and other fluoride-related ailments (see Point 5).

**Find Out 50 MORE Reasons Against Fluoride**

medium [1.70 (significantly elevated)] and high (1.65) arsenic exposure (Lewis et al. 1999).

In a study from Australia, geographic areas with soil arsenic > 100 mg/kg and/or drinking-water concentrations > 0.01 mg/L were selected and related to cancer incidence (Hinwood et al. 1999). Standardized incidence ratios (SIRs) were generated for 22 areas of elevated arsenic exposure in Victoria and compared with all Victorian cancer rates as a baseline. For all areas with any elevated arsenic (soil or water or both), the SIR was significantly increased for prostate cancer (1.14; 95% CI, 1.05–1.23). Exposure was also stratified as only high soil or only high water arsenic (low) or both high soil and high water arsenic (high). When arsenic exposure was stratified by exposure type (i.e., high water only, high soil only, high water/high soil), the SIR for prostate cancer remained significantly elevated (1.20; 95% CI, 1.06–1.36), in the high water/high soil category. Dose–response analysis was performed on data stratified based on water content of arsenic as low (< 0.01 mg/L), medium (0.01–0.1 mg/L), high (0.1–0.2 mg/L), and very high (> 0.2 mg/L) levels. No linear dose response was detected for prostate cancer incidence using this water stratification, but based on graphical presentation, the SIRs for the high and very high categories appeared elevated (95% CIs did not include 1.0). The study included 619 cases of prostate cancer. The authors make the point that of those targets expected *a priori* from other studies, only prostate cancer was significantly elevated.

In a population of male copper foundry workers industrially exposed to arsenic as well as other metals, a correlative survey of plasma neoplastic biomarkers was conducted (Szymanska-Chabowska et al. 2004). A strong positive correlation occurred between urinary arsenic concentration and serum prostate-specific antigen (PSA). PSA is a well-established biomarker for prostate cancer that is considered a mainstay of early prostate cancer detection. The exposure to other metals complicates interpretation of this study, but the correlation between arsenic in the urine and circulating PSA was robust. In this regard, tumors arising from human prostate epithelial cells transformed by inorganic arsenic *in vitro* also show a remarkable overexpression of PSA (Achanzar et al. 2002).

The results of various positive studies of prostate cancer and arsenic exposure were considered as a whole by the IARC (2004). The specific conclusion was that "data from southwest Taiwan indicate a consistent pattern of increased mortality from prostate cancer in areas with high contamination by arsenic, and there is evidence of a dose-related effect" (IARC 2004). Although the prostate was not specifically mentioned as a human target site in the final evaluation of the monograph, the implications of the text are clear and, at least in part, are supported by the data from the United States and Australia, which make it less likely that the Taiwanese are uniquely sensitive. Whatever the conclusion, the available evidence indicates an obvious need for additional studies of arsenic as a human prostatic carcinogen.

As a potential complicating factor in dose–response analysis, evidence indicates that arsenic can adversely affect testicular function in animals, even at levels near the range for some human exposure situations. This includes loss of testicular weight, diminished sperm count, and decreased 17β-hydroxysteroid dehydrogenase (17β-HSD) activity in mice chronically given 4 ppm arsenic in the drinking-water (Pant et al. 2004). In this regard, 17β-HSD is an enzyme important in production of testosterone from its immediate precursors, such as androstenedione. Similarly, in rats chronic oral arsenic exposure decreases testicular weight, sperm count, testicular 17β-HSD activity, and plasma and testicular testosterone concentrations (Jana et al. 2006). Prostate cancer, particularly in its early stages, is dependent typically on circulating androgens and will regress with orchiectomy and/or antiandrogen therapy, two strategies commonly used in prostate cancer treatment (Kyprianou and Isaacs 1988). Thus, if higher doses of arsenic similarly suppressed testosterone production in humans, this could complicate the dose–response analysis by potentially diminishing carcinogenic response at higher doses. There is no direct evidence of this in humans, however.

## *In Vitro* Model of Arsenic-Induced Prostatic Carcinogenesis

# 'Hot' times in the city: People get radioactive

## Americans, along with kitty litter and toilets, setting off nuclear alarms

By Ian Hoffman
STAFF WRITER

In placing radiation detectors in key cities, ports and border crossings, defense scientists and the federal government are finding remarkable amounts of radioactive material moving around the country.

Kitty litter, granite and truckloads of porcelain toilets headed for Home Depot and Lowes are setting off radiation alarms. And they are not remotely as "hot" as the humans.

With the explosion of nuclear medicine, physicians are giving radioactive drugs to people an estimated 20 million times a year. For a few days to several weeks, those people are emitting gamma rays, beta particles or X-rays that can radiate beyond the walls of cars, buses and subway trains to reach the at-

Please see ALARMS, News 7

TUESDAY, December 21, 2004

THE ARGUS

Fremont

# People turning up radioactive

ALARMS, from News 1

tention of anti-terror authorities.

"If you have a radiomedical treatment, you are the hottest thing around," said Linda Groves, an ex-Navy captain who analyzes radiation detection data for Sandia National Laboratories in Livermore.

In the event of alarm, authorities are stopping and questioning motorists whose vehicles come up radioactive.

"I did some deployments, and we scared some little old ladies to death," Groves said. "Doctors are not doing a good enough job of telling folks what they're carrying."

As agencies of the U.S. Department of Homeland Security look for smuggling of ingredients for nuclear and "dirty" bombs, authorities are having to stop roughly one in every 1,000 vehicles and cargo shipments for closer inspection and ques-

Most alarms are for cargo — everything from nuclear-reactor fuel to Fiestaware saucers to small cesium sources trucked around to construction sites to test the integrity of welds. But depending on proximity to big cities and major hospitals, as many as one-third of radiation alarms in public places and thoroughfares are being triggered by medical patients.

"Even if it's 10 percent, that means on any given day, just people driving on the highways, one out of every 10,000 are running around radioactive," said Page Stoutland, head of nuclear and radiological countermeasures at Lawrence Livermore National Laboratory.

At one New York port, as many as one in 1,000 truck drivers are turning up radioactive, which indirectly suggests they're getting good preventive health care. Increasingly, truckers, police and other workers in sensitive or stressful jobs are getting mandatory stress tests requiring a trace dose of a radioactive substance.

Thallium 201 illuminates blood flow in the heart and is the most common radiopharmaceutical. It also sets off radiation alarms for up to 30 days, according to a recent study by Lionel Zuckier, a radiology professor at the New Jersey Medical School and director of nuclear medicine at University Hospital in Newark and colleagues. Another radioactive drug used in thyroid treatments, iodine-131, can last up to 95 days. That's longer than doctors thought, based on their own detection devices, Zuckier said.

That's because U.S. Customs, Border Patrol and Transportation Security Administration officials are carrying radiation detectors that can be 1,000 times more sensitive than nuclear-medicine cameras in major hospitals, Zuckier said. Those cameras provide stunningly detailed shots of the human body, in part by ignoring most of the artificial radiation.

"That's why we get an image that makes some sense. Otherwise, it would be a blur," he said.

The homeland security detectors are designed to take in as much radiation as possible, and have hair-trigger alarms set just above natural background.

"These things are extremely sensitive," Zuckier said. "It's a whole new level of detection."

The startling radiation readings on Americans in the wild is just one of several insights into the human and natural world that the U.S. government is getting as it deploys new sensing devices and monitoring technologies nationwide.

showed 26. This was particularly surprising, given that even the Swedish homes built of alum shale concrete were nowhere near this high. Rundo and his colleagues imagined at first that the radon might be coming from the smoke detector (such devices normally contain radioactive elements) or the ceramic tile in the house; it turned out to be coming from the earth below an unpaved crawl space under the kitchen and living room. The Argonne group concluded that "the average exposure of man to radon daughters in houses in this country may be substantially higher than has hitherto been thought" and urged further research to determine the scope of the hazard.[26]

Nero's and Rundo's observations were published in rather obscure journals of the health physics profession, attracting little attention. What did attract attention was the failure of the main reactor at Three Mile Island on the Susquehanna River on March 28, 1979—initiating the nation's most infamous, if not most deadly, nuclear accident. (*The China Syndrome*, a popular movie dramatizing the possibility of a reactor core meltdown, was released about the same time as the accident.) Though it proved not to have been as serious an accident as many originally believed, the fears it generated provided a powerful stimulus for further work on radioactive hazards, including radon. Responding to the incident, Pennsylvania environmental officials began to look for radioactive contaminants in nearby homes and found, to their great surprise, that many had very high levels of ambient radioactivity (20–100 picocuries per liter) quite independent of the accident.

DOE officials were also continuing to find houses with very high levels of radon. About two weeks after the Three Mile Island mishap, DOE scientists working on the health effects of indoor air pollution discovered that several of the energy-efficient homes they had been monitoring on the East Coast showed high levels of indoor radon. Anthony Nero received a call from a colleague reporting that a house in Maryland had been found with 20 picocuries per liter. This was a specially designed energy-efficient house, the entire outside of which had been sprayed with a plastic sealant, and it appeared to confirm the fears of LBL scientists that energy conservation might well produce a radon hazard. Nero recalls his astonishment at the time, given that this was "the radiation equivalent of having a Three Mile Island accident . . . occur in the neighborhood once a week."[27] Radiation in the Maryland home equaled the occupational limit for nuclear workers recognized by both the National Council on Radiation Protection (NCRP) and the Mine Safety and Health Administration (MSHA).[28]

The EPA picked up on the issue about this time. It had become involved in the mid-1970s, in response to Florida officials' concerns about radioactivity in homes built over land reclaimed from phosphate mines. Florida was the nation's leading producer of phosphate fertilizers: over 80 percent of the nation's output—and one-third of the world's—came from the strip mines in and around Polk County in the central part of the state. Phosphate by itself is not normally radioactive, but phosphate in the ground is commonly associated with uranium. (More uranium is indeed discarded in the course of phosphate mining than is obtained through uranium mining itself: early EPA studies identified phosphate tailings as a potential uranium resource.)[29] In May 1976 President Gerald Ford ordered the EPA to investigate the problem after a preliminary EPA study indicated that houses in the area had enough

STATE SUPREME COURT

we recycle water, Every year 59 tons are added to the Bay Area's water

# Onus on firms to disclose bad water

B4 | Wednesday, June 24, 2009 | SAN FRANCISCO CHRONICLE AND SFGATE.COM

By Bob Egelko
CHRONICLE STAFF WRITER

Government agencies that oversee thousands of small water suppliers in California don't have to order the companies to notify their customers when their water is contaminated, the state Supreme Court has ruled.

The court ruled Monday in a case brought by about 80 residents of a Carmel Valley mobile home park, who blamed ailments ranging from rotted teeth and brittle bones to lost kidneys on years of drinking water with too much fluoride.

A lawyer for the residents said the unanimous decision leaves customers of small water systems without protection.

"The government agency's supervisory role is meaningless," said attorney Brian Burchett, whose clients wanted Monterey County held responsible for their health problems. "They're totally at the mercy of the system operator," who in this case, he said, was untrained and uninsured.

Deputy County Counsel Patrick McGreal countered that state law makes water system operators, not public agencies, responsible for notifying customers about contamination.

Although government agencies regulate the water systems and have a duty to maintain water quality, McGreal said, requiring a county to police an operator's customer contacts would impose "open-ended liability."

The ruling applies to the 5,500 water systems in the state that serve fewer than 200 customers. They are regulated by local agencies in 35 counties, including Contra Costa, San Mateo, Marin and Napa, according to state records. The state Department of Public Health oversees small water systems in the other 23 counties. Larger municipal water systems are governed by a separate law.

The suit was filed by people who lived at the 25-trailer Jensen Camp Mobile Home Park in Cachagua from 1995 to 2003. They said the owner, Rick Pinch, who also operated the water system, never told them that his reports to the county showed fluoride content that reached more than four times the safety level.

The county health agency did not order Pinch to fix the system until April 2003, the plaintiffs said. Four months later, Pinch sold the site to two residents, who learned of the contamination and started supplying bottled water to the homes.

The residents' suit against Pinch is still pending. A state appeals court ruled in September 2007 that they could sue the county as well, for allegedly failing to review the reports and tell Pinch to notify them of the contamination, but the state Supreme Court disagreed.

A supervising agency is required under state law to tell a system operator to monitor water quality, but nothing more, Justice Ming Chin said in Monday's ruling.

*E-mail Bob Egelko at begelko@sfchronicle.com.*

## Read the ruling

The ruling in Guzman vs. Monterey County, S157793, can be read at links.sfgate.com/ZHLT.

Fluoride Action Network.org

| | | | | |
|---|---|---|---|---|
| Antimony | 0.006 | 0.006 | Increase in blood cholesterol; decrease in blood sugar | Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder |
| Arsenic | 0[I] | 0.010 as of 01/23/06 | Skin damage or problems with circulatory systems, and may have increased risk of getting cancer | Erosion of natural deposits; runoff from orchards, runoff from glass & electronicsproduction wastes |
| Asbestos (fiber >10 micrometers) | 7 million fibers per liter | 7 MFL | Increased risk of developing benign intestinal polyps | Decay of asbestos cement in water mains; erosion of natural deposits |
| Barium | 2 | 2 | Increase in blood pressure | Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits |
| Beryllium | 0.004 | 0.004 | Intestinal lesions | Discharge from metal refineries and coal-burning factories; discharge from electrical, aerospace, and defense industries |
| Cadmium | 0.005 | 0.005 | Kidney damage | Corrosion of galvanized pipes; erosion of natural deposits; discharge from metal refineries; runoff from waste batteries and paints |
| Chromium (total) | 0.1 | 0.1 | Allergic dermatitis | Discharge from steel and pulp mills; erosion of natural deposits |
| Copper | 1.3 | TT[9]; Action Level=1.3 | Short term exposure: Gastrointestinal distress<br>Long term exposure: Liver or kidney damage<br>People with Wilson's Disease should consult their personal doctor if the amount of copper in their water exceeds the action level | Corrosion of household plumbing systems; erosion of natural deposits |
| Cyanide (as free cyanide) | 0.2 | 0.2 | Nerve damage or thyroid problems | Discharge from steel/metal factories; discharge from plastic and fertilizer factories |
| Fluoride | 4.0 | 4.0 | Bone disease (pain and tenderness of the bones); Children may get mottled teeth | Water additive which promotes strong teeth; erosion of natural deposits; discharge |

MATERIAL SAFETY DATA SHEET
North American Version

# FLUOROSILICIC ACID 23-25%

## 1. PRODUCT AND COMPANY IDENTIFICATION

**1.1. Identification of the substance/preparation**

| | | |
|---|---|---|
| Product Name | : | Fluorosilicic Acid, 23-25% |
| Chemical Name | : | Silicate (2-) Hexafluoro-dihydrogen |
| Synonyms | : | Hydrofluorosilicic acid, fluosilicic acid, HFS, FSA |
| Chemical Formula | : | $H_2SiF_6$ |
| Molecular Weight | : | 144 |
| CAS Number | : | 16961-83-4 |
| Grades/Trade Names | : | None· |

**1.2. Use of the Substance/Preparation**

Recommended use : Chemical intermediates, Water fluoridation

**1.3. Company/Undertaking Identification**

Address : Solvay Fluorides, LLC
PO BOX 27328 Houston, TX 77227-7328
3333 Richmond Ave. Houston, Texas 77098

**1.4. Emergency telephone numbers**

**General:** 1-877-765-8292 (Solvay Chemicals, Inc.,)
**All Emergencies (USA):** 1-800-424-9300 (CHEMTREC•)
**Transportation Emergencies (INTERNATIONAL/MARITIME):** 1-703-527-3887 (CHEMTREC•)
**Transportation Emergencies (CANADA):** 1-613-996-6666 (CANUTEC)
**Transportation Emergencies (MEXICO-SETIQ):** 01-800-00-214-00 (MEX. REPUBLIC)
525-559-1588 (Mexico City and metro area)

## 2. HAZARDS IDENTIFICATION

**2.1. Emergency Overview:**

***General Information***

| | | |
|---|---|---|
| Appearance | : | liquid |
| Color | : | colorless |
| Odor | : | pungent |

***Main effects***

- Corrosive product, very hazardous to human health and the environment.
- Presents hazards from its ionizing fluorine.
- In case of decomposition, releases hydrogen fluoride.
- Toxic by inhalation, in contact with skin and if swallowed.
- Risk of cardiac and nervous disorders.
- Causes burns.
- Chronic exposure (to the product) at high concentrations can cause bone fluorosis.



Solvay Fluorides
A Subsidiary of Solvay Chemicals, Inc.

SOLVAY

- Seriousness of lesions and prognosis of intoxication depend directly on the concentration and duration of exposure.

### 2.2. Potential Health Effects:

***Inhalation***

- Severe respiratory irritant
- Spasmodic cough and difficulty in breathing.
- Risk of chemical pneumonitis and pulmonary (o)edema.
- At high concentrations, risk of hypocalcemia with nervous problems (tetany) and cardiac arrhythmia.
- In case of repeated or prolonged exposure: risk of sore throat, nose bleeds, chronic bronchitis.

***Eye contact***

- Severe eye irritation, watering, redness and swelling of the eyelids.
- Burns
- Risk of serious or permanent eye lesions.
- May cause blindness.
- Intoxication hazards by inhalation of the product simultaneously.

***Skin contact***

- Painful irritation, redness and swelling of the skin.
- Severe burns; slow healing.
- Risk of shock.
- Risk of hypocalcemia following the extent of the lesions.
- Intoxication hazards by inhalation of the product simultaneously.

***Ingestion***

- If ingested, severe burns of the mouth and throat, as well as a danger of perforation of the esophagus and the stomach.
- Risk of throat (o)edema and suffocation.
- Nausea, vomiting (bloody), abdominal cramps and diarrhea (bloody).
- Cough and difficulty breathing.
- Risk of chemical pneumonitis from product inhalation.
- Risk of hypocalcemia with nervous disorders (tetany) and cardiac rhythm disorders.
- Risk of convulsions, loss of consciousness, deep coma and cardiopulmonary arrest.
- Risk of general symptoms having a severe prognosis.

***Other toxicity effects***

See section 11: Toxicological Information

### 2.3. Environmental Effects:

See section 12: Ecological Information

## 3. COMPOSITION OF/INFORMATION ON INGREDIENTS

**Hexafluorosilicic acid**

| | | |
|---|---|---|
| CAS-No. | : | 16961-83-4 |
| **Concentration** | : | 23-25% |

**Water**

| | | |
|---|---|---|
| CAS-No. | : | 7732-18-5 |
| **Concentration** | : | Balance |


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# California Seeking to Ride the Alkaline Hydrolysis Wave

**Bill Advances to Senate, Approval Expected**

*Taken from the May 13, 2010, edition of the Memorial Business Journal*

Sacramento – Last week the California State Assembly unanimously approved A.B. 2283, which would amend the state's Health and Safety code to change the definition of cremation to include alkaline hydrolysis, a "chemical dissolution process using heat, high pressure water, and potassium hydroxide to hydrolyze human tissue and the consumable container."

Introduced by Assemblyman Jeff Miller, the bill has been advanced to the state senate for consideration. If approved, California would join Florida, Maine and Oregon as states that have taken legislative action to permit the process for the general public. A number of other states, including Minnesota and Colorado, permit the practice for institutional procedures, such as the disposition of cadavers at medical and veterinary schools. Meantime, a number of states are having the conversation about amending their laws to include the process in their approved methods of disposition of human remains. Some states argue that while the process isn't officially "legal" in their states for public consumption, it isn't illegal either. Meaning a business could test the waters and seek to install a facility following the licensing and permit process currently on the books.

The California bill also instructs the state's Cemetery and Funeral Bureau to adopt regulations for the safe operation of alkaline hydrolysis chambers no later than July 1, 2011.

Robert J. Achermann, executive director of the California Funeral Directors Association, which supported the bill, noted that there is no opposition to the A.B. 2283 and he does not expect there to be any problem getting the bill through the state senate and signed by the governor.

"The association has had meetings with Miller's office about some of the technical issues about how you define the process," Achermann said. "I think most funeral directors believe this is something that will generate consumer interest as an alternative to traditional cremation." Another consideration in the state — cemeteries in California, especially near the major metropolitan areas, are running short on space.

Supporters call alkaline hydrolysis, which is also referred to as bio-cremation, Resomation or water resolution, a "greener" alternative to traditional cremation. The process itself reportedly uses about less than 20 percent of the energy used for a cremation. Further, CO2 emissions are reduced by nearly 90 percent and the process avoids putting mercury and other harmful contaminants into the atmosphere.

Basically, a body is placed into a stainless steel container with potassium hydroxide (a form of lye) and heated to more than 300 degrees F. Turbulence is used to accelerate the dissolving of flesh and soft tissue. Usually the process takes, on average, about three or four hours. What's left is a sterile liquid substance containing amino acids, peptides, sugars and salts that are purportedly environmentally friendly and can be washed down the drain. The remaining bone fragments are whiter in appearance than those that are cremated. The bones are then pulverized into a fine white, ash-like substance and can be returned to the family.

With Matthews manufacturing both traditional cremation retorts and bio-cremation vessels, Schaal commented on the maintenance issue. "Since there is no refractory, there would be none of these costs for floors, walls or ceiling," he said, adding that since the interior is all stainless steel, the occasional bath rinse is required.

"The biggest maintenance we initially see is the door seal, which would be monitored and replaced probably once per year with an annual inspection," Schaal said. "The material cost is probably less than $50 so we view this as a direct saving to owners/operators."

David Nixon, Nixon Consulting, Chatham, Ill., said that the technology is still too new to have a solid compilation of data. "A traditional retort will have to rebrick after so many hours," he said. "But we don't know what the long-term picture is. Until a history of data is developed, maintenance of the alkaline hydrolysis chambers is speculative. Five or 10 years down the road we will find out what the maintenance issues are."

Maine and Oregon revised their crematory and licensing rules in late 2009. So far, neither state has a working facility nor is one planned. "I don't think any are in the formative phase," said Sally Belanger, executive director of the Maine Funeral Directors Association, "Word of such activities would travel fast through Maine," she added. Last fall Maine revised its definition of cremation to include "The technical process, using direct flame and heat, or other process, that reduces human remains to bone fragments. The reduction takes place through heat and evaporation, or through other processes, including, but not limited to, chemical dissolution."

More than 60 percent of the deaths per year in Oregon are cremated. Mark Stehn, executive director of the Oregon Funeral Directors Association, said the association did support last year's effort amend ORS 692 which allows the state's Mortuary & Cemetery Board to license new and emerging technology, if it meets the permit requirement within the county.

To the north, Jewell Steffensen, executive secretary of the Washington State Funeral Directors Association, said that a process to review changes to the law to allow alkaline hydrolysis is underway. Steffensen said a letter was sent to the Department of Licensing, Funeral & Cemetery Division by Matthews International asking what type of requirements would be needed in order to have a unit installed in a funeral home in Washington. "In April the board members met for their regular meeting in which I attended," Steffensen said. "They moved to form a committee with stakeholders to review what changes, if any, to the Revised Code of Washington and/or the Washington Administrative Code would be needed to regulate the bio-cremation system. All of them felt that this would eventually pass."

Neither the National Funeral Directors Association nor the International Cemetery, Cremation & Funeral Association have adopted a position on the alkaline hydrolysis process. "We see it as another disposition option from which families may choose, in addition to earth burial, entombment in a mausoleum or cremation," said Jessica Koth, NFDA public relations manager. "The only challenge that might exist for an individual or family that wants to select alkaline hydrolysis for themselves or a loved one is availability – it is not something that is generally available to consumers.'

Koth added that NFDA encourages further study of the alkaline hydrolysis process to fully understand its impact on the environment and the health and safety of funeral professionals and communities.

However, the Cremation Association of North America has recognized alkaline hydrolysis as a form of disposition that is similar to cremation and is including it as a variant of the cremation process. "Our recently revised Model Cremation Law speaks of the 'mechanical and/or thermal or other dissolution

**The following are cold Remedies pulled by the FDA from the shelves because of their amine ingredient:**

(Medical diseases influenced by amines were and are hemorrhagic stroke or bleeding in the brain, with women at risk more than men, and diabetics, and, cancer chemotherapy patients.)



## PPA-AFFECTED DRUGS

Some of the products that contain phenylpropanolamine (PPA):

AcuTrim Diet Gum Appetite Suppressant Plus Dietary Supplements
AcuTrim Maximum Strength Appetite Control
Alka-Seltzer Plus Children's Cold Medicine Effervescent
Alka-Seltzer Plus Cold Medicine (Cherry or orange flavor)
Alka-Seltzer Plus Cold Medicine Original
Alka-Seltzer Plus Cold & Cough Medicine Effervescent
Alka-Seltzer Plus Cold & Flu Medicine Effervescent
Alka-Seltzer Plus Cold & Sinus Effervescent
Alka-Seltzer Plus Night-Time Cold Medicine Effervescent
BC Allergy Sinus Cold Powder
BC Sinus Cold Powder
Comtrex Deep Chest Cold & Congestion Relief
Comtrex Flu Therapy & Fever Relief Day & Night
Contac 12 Hour Cold Capsules
Contac 12 Hour Cold Caplets
Coricidin 'D' Cold, Flu & Sinus
Dexatrim Caffeine Free
Dexatrim Extended Duration
Dexatrim Gelcaps
Dexatrim Vitamin C/Caffeine Free
Dimetapp Cold & Allergy Chewable Tablets
Dimetapp Cold & Cough Liqui-Gels
Dimetapp DM Cold & Cough Elixir
Dimetapp Elixir
Dimetapp 4-Hour Liqui-Gels
Dimetapp 4-Hour Tablets
Dimetapp 12-Hour Extentabs Tablets
Naldecon DX Pediatric Drops
Permathene Mega-16
Robitussin CF
Tavist-D 12 Hour Relief of Sinus & Nasal Congestion
Thinz-Span Capsules Appetite Suppressant
Triaminic DM Cough Relief
Triaminic Expectorant Chest & Head Congestion
Triaminic Syrup Cold & Allergy
Triaminic Triaminicol Cold & Cough
Walgreens brand:
Wal-hist-D Cold and Allergy Symptoms
Wal-tap 12-Hour Relief of Cold and Allergy Symptoms
Wal-tap Elixir Grape
Wal-tussin

SOURCE: Consumer Healthcare Products Association, Examiner survey.
Compiled by Examiner staff and wire services

EXAMINER GRAPHIC

Dr. Winn Parker Ph.D. (MT)
P.O. Box 864
Millbrae, California 94030

COPY AND PASS ON

e-mail: KWATT@SBCGLOBAL.net

damage consis...
and-run.

Ory, 28, has been charged with felony hit-and-run. He is due back in court today for a preliminary hearing.

## Chloramine debate hits City Hall

A handful of Millbrae residents continue to appeal to the City Council each meeting, seeking some relief from chloramines recently added to their water.

For weeks now, Millbrae resident and scientist Winn Parker has made an impassioned plea for the city to join the fight against the San Francisco Public Utilities Commission, which added the new disinfectant to the Hetch Hetchy Water System in February. He cites research showing the additive — a combination of chlorine and ammonia — can contribute to a range of health concerns.

Each time city officials respond by saying they have no say in the matter.

A link from the city's website (http://ci.millbrae.ca.us) claims the additive has been known to improve the taste of the water while removing carcinogens.

## Naked attacker foiled

A woman walking through the sprawling Shelter Creek condominium complex in San Bruno at 1:43 p.m. on March 21 was grabbed from behind by a man who was completely naked except for a

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phreys said. "But if you
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to write about."

That was spring 2001,
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three different cycles fin
to write about. He left hom
2001 with his life savings
and a plan to pedal aroun
raising money for Hope
For Children, a charity
help children who have be
by civil war and AIDS.

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could agree upon and
Humphreys has biked
the White Cliffs of Dover,
and to the Pyramids in E
desert in Sudan and climbe

# UNINTENDED CONSEQUENCES OF CHLORAMINE HIT HOME

Marc Edwards, Becki Marshall, Yan Zhang and Yoon-Jin Lee
Department of Civil Engineering
Virginia Tech
Blacksburg, VA 24061-0246

## ABSTRACT

The known drawbacks of chloramination include nitrification, elastomer decay, and required pre-treatment steps for fish culture and dialysis patients. To date, there has been no explicit consideration of adverse consequences of chloramination on property and water quality in buildings. Specifically, the effect of chloramine on re-growth of bacteria during stagnation, plumbing failures and lead leaching are poorly understood.

Potential problems with bacterial re-growth can arise in building plumbing systems after chloramines decay and form free ammonia. Autotrophic nitrifying bacteria convert the free ammonia to nitrite and nitrate while creating organic carbon in the form of biomass and soluble microbial products. The levels of organic carbon created by nitrifiers are sufficient to support the growth of heterotrophic (HPC) bacteria. In one water tested with long stagnation times, HPC reached $10^6$ -$10^7$ cfu/ml using chloramines, whereas HPC was 1000x less when chlorine disinfectant was used. The decay of chlorine does not release nutrients for bacterial growth—a significant advantage relative to chloramine in situations with low flow and long detention times. Because the water within home plumbing is rarely sampled for bacteria, the true extent of the problem is not detected by routine distribution system monitoring using flushed samples.

A switch to chloramine may increase lead leaching, brass failures and pinhole leaks under at least some circumstances. Of these problems, pinhole leaks and brass failures have the largest potential economic consequence. For instance, a single re-plumb can cost an individual consumer 500x more than the median annual projected cost of the Stage 2 regulation. The adverse public health impacts of mold growth from pinhole leaks, lead leaching and bacterial re-growth deserve consideration. While these problems may eventually prove to be rare events, they have significant consequences for the unfortunate consumers who are impacted. If these events prove to be widespread, alternatives to chloramine will become more attractive despite higher initial cost to utilities.

## KEYWORDS

Re-growth, nitrification, brass failures, copper pinholes, lead, chloramine

## INTRODUCTION

The United States Environmental Protection Agency (US EPA) Stage 1 and Stage 2 Disinfectants and Disinfection By-Products Rule (D/DBPR) has been actively negotiated since 1992 (AWWA, 2003a). The estimated benefits of the new Stage 2 regulation range from $0-986 million per year while projected costs are $54-64 million per year (Federal Register, 2003). In systems that require new treatments to meet Stage 2 requirements, the estimated increase in mean annual water bill per household is $8.38/year (Federal Register, 2003). To support the science behind these regulations, well over $100 million in research has been conducted to better define the risks from DBPs, microbial pathogens, and to support collection of occurrence and treatment data (US EPA, 1999).

**You Can't Drink This Water**

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# Ban Fracking Now

DONATE

**Your Water Is More Important than Big Oil's Profits!**

Help us ramp up our campaign to protect your water from fracking!

Dear Wynn,

This morning we've organized hundreds of people to travel to the *Shale Gas Outrage Rally* in Philadelphia, where thousands of people from across the country are coming together to fight against fracking. **This dangerous practice has already contaminated more than 1,000 water wells and caused many other serious problems like explosions, quarantined livestock and radioactive wastewater.**

**We're working tirelessly to stop fracking, and we need your support to ramp up our campaign.**

Help us raise $20,000 by September 16th so we can ramp up our campaign to ban fracking!

**Help Make Sure Your Drinking Water is Protected from Fracking by contributing $35!**

Communities across the country are racing to protect their water from the dangerous and unnecessary practice of fracking. From Dimock, Pennsylvania to Santa Barbara, California, residents are standing up and saying "Ban Fracking Now." We're working with folks in some of the frontline communities to ban fracking so that they'll have safe clean water for their families and livelihoods, but we need to expand our efforts.

We recently put out a request for people to organize their friends and families to make calls to the White House to ban fracking, and over 600 of you responded! We know that you and others are eager to take action on the ground in your communities, and we want to ramp up our work to help you fight fracking.

**Can you help us reach our goal of raising $20,000 by September 16th so we can take the "Ban Fracking Now" work to the next level?**

**Here's how we're planning to ramp up our campaign if we reach our $20,000 Goal:**

► **With $6,000**, we'll send our organizers to the communities fighting fracking from New York to California to help develop local organizing strategies for a fracking ban.

► **With $5,000**, we'll gather 50,000 comments to deliver to the Delaware River Basin Commission, asking them to ban fracking to protect the drinking water of 15 million people.

► **With $4,000**, we'll send our activists to Big Oil and Gas Industry conferences to collect information on the industry's strategy.

► **With $3,000**, we'll be able to send 300 people on buses to important rallies and public hearings to ban fracking.

► **With $2,000**, we'll be able to train 600 national activists to host call-in days and take action in their communities.

**So why exactly is fracking so bad?**

Fracking, or hydraulic fracturing, involves pumping huge volumes of toxic fluids, laced with carcinogens, underground at high pressures to fracture shale rock and release natural gas. During the process, some of the water used returns as toxic, even radioactive, wastewater. Even more disturbing is that the bulk of the toxic fracking fluid stays underground indefinitely. So, decades after oil and gas companies have made their profits and moved on, billions of gallons of toxic fracking fluid will be left behind, threatening to contaminate vital groundwater resources for generations. **Unfortunately this entire process is exempt from the Safe Drinking Water Act.**

**If you agree with us, and think this is bad, please contribute $35 today** to help raise $20,000 to ramp up the campaign to ban fracking.

Support the Campaign to Ban Fracking:

See more news releases in: Publishing & Information Services, Dentistry, Health Care & Hospitals, Medical Pharmaceuticals, Surveys, Polls and Research, Advocacy Group Opinion

# Fluoride Can Cause Cancer, Studies Show

NEW YORK, Sept. 15, 2011 /PRNewswire-USNewswire/ -- Many published human and animal studies have reported an association between fluoride and various cancers, including valid and unrefuted scientific evidence that fluoride can increase the risk of osteosarcoma (a type of bone cancer) in boys and young men, reports the Fluoride Action Network (FAN) in its recent submission to the California Environmental Protection Agency's Office of Environmental Health Hazard Assessment (OEHHA). (1)

Fluoride is commonly added to municipal water supplies and dental products with the intention of reducing tooth decay. However, current scientific evidence shows that swallowing fluoride does much more harm than good.

OEHHA requested public comments on its recently-released document "Evidence on the Carcinogenicity of Fluoride and Its Salts," (2) where OEHHA states:

"multiple lines of evidence...appear to support several plausible hypotheses: that fluoride is incorporated into bones...where it can stimulate cell division of osteoblasts [bone-forming cells]...; induce genetic changes; induce other cellular changes leading to malignant transformation, and alter cellular immune response...***thereby increasing the risk of development of osteosarcomas***" (our emphasis).

The Carcinogen Identification Committee (CIC) of OEHHA's Science Advisory Board is scheduled to review the carcinogenicity status of fluoride on October 12-13.

FAN Executive Director Paul Connett, Ph.D., says, "Special interest groups are already protecting fluoride rather than the people who are consuming it." For example, the American Dental Association recently gave the California Dental Association $200,000 "to assist in our effort to prevent the placement of 'fluoride and its salts' on the List of Chemicals Known to the State to Cause Cancer" (3).

Organized dentistry must overcome the following inconvenient facts if it continues to assert fluoridation is safe for everyone:

According to the National Research Council's (NRC) 2006 *Fluoride in Drinking Water* report, "fluoride appears to have the potential to initiate or promote cancers, particularly of the bone ... osteosarcoma is of particular concern ..."

Bassin et al. (2006) reported in *Cancer Causes and Control* that fluoride exposure is linked to an increased risk of osteosarcoma in boys and young men.

Bassin's Harvard University doctoral advisor, Chester Douglass, signed off on Bassin's results, but then promised his larger study would refute Bassin's findings. However, Douglass's study, when finally published in the *Journal of Dental Research* (7/28/11), was seriously flawed and incapable of refuting Bassin's results. (4)

Connett says, "Douglass's 'financial ties to corporations profiting from fluoride sales make Douglass's involvement with any study related to fluoride and health effects a serious conflict of interest.'"

But Bassin's isn't the only study linking fluoride with an increased risk of cancer.

In 1990 the National Toxicology Program (NTP) reported an increase in osteosarcoma in male rats exposed to fluoride, an increased risk for liver and oral cancers, and an increase in thyroid follicular cell tumors.

Among human studies, Hoover et al. (1991) found a 79% increase in osteosarcoma in males under 20 years old in fluoridated counties, compared to a 4% decrease in non-fluoridated counties over time.

Cohn (1992) similarly reported an increased risk for osteosarcoma in males under age 20 living in fluoridated versus non-fluoridated counties.

Also, the NRC recommends further research be conducted on the effects of fluoride on the risk of bladder cancer.

In addition, the most commonly used fluoridation chemicals (silicofluorides) have been linked with increased levels of lead in children's blood, according to Kathleen Thiessen, Ph.D., a risk analysis professional who has served on two NRC subcommittees dealing with fluoride toxicology.

Thiessen's submission to CIC states: "[U.S.] EPA considers lead to be a probable human carcinogen...there is considered to be no safe level of lead exposure, and the MCLG [maximum contaminant level goal] for lead is zero. OEHHA should be aware that silicofluoride use is associated with increased blood levels of a human carcinogen (one that is also associated with neurotoxicity and developmental toxicity), apart form the carcinogenicity of fluoride itself." (5)

FAN's submission concludes: "While we understand that there will be tremendous pressure put on the CIC and OEHHA by the proponents of fluoride and fluoridation, we ask that the Committee continue to rely on its high level of scientific knowledge and integrity when deliberating and reaching a final conclusion on the carcinogenicity status of fluoride and its salts."

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# NEUROTOXIC EFFECTS OF FLUORIDE

**SUMMARY: This issue of *Fluoride* contains three new reports on fluoride (F) and neurotoxicity. A study of neurotoxic effects of F in aluminum potroom workers in Iran shows the importance of neurobehavioral testing for the early detection of cognitive impairment in workers occupationally exposed to airborne F. Two studies, from Iran and India, examined the IQ of children drinking high F water (2.38 and 2.45 mg F/L [ppm], respectively), but only one of the two studies showed what was considered a statistically significant result. Attention is thus drawn to the importance of examining confounding and effect-modifying factors. For example, the reported protective effects of magnesium against F toxicity in certain drinking waters, especially when they are soft, need to be considered. Whether there is a threshold at which neurotoxicity from F begins to occur is examined by considering nine other studies showing a significant association between lower IQ or neonatal neurobehavioral impairment and higher oral F intake. If the accumulated evidence of human neurotoxicity from F is viewed dispassionately, two conclusions can be drawn. Airborne F in industrial situations may pose a health risk to workers and may be detected by neurobehavioral testing. The studies currently available on the development of IQ all have their limitations, and although cases can be made, based on a pool of eight reports and a paper by Xiang et al., respectively, for levels of F in drinking water of 0.1 and 0.185 mg F/L being safe for all children, other evidence, from Ding et al., suggests that even a level as low as 0.081 mg F/L is not safe. Thus there is no threshold for F neurotoxicity in drinking water, and the only assuredly safe level is zero.**

**Keywords**: Airborne fluoride; Confounding factors; Effect-modifying factors; Fluoride threshold; IQ; Neurotoxicity; Psychomotor effects; Safety factor; Serum fluoride; Urinary fluoride; Water fluoride.

*Airborne fluoride:* In a 1970 editorial, Waldbott noted that the toxic effects of airborne fluoride (F) on human health had been difficult to study.[1] He found that such assessment was still in its infancy. Later, in 1978, he reported, with Lee, the occurrence of intellectual impairment and memory loss from repeated exposure to airborne HF (hydrogen fluoride) in a petroleum industry worker.[2] In 2001, Guo, He, and Zhu found that Chinese aluminum potroom workers with raised urine and serum F levels had a number of neurobehavioral impairments, most of which showed a correlation with the serum F.[3] The toxicity was attributed to airborne F. Similar neurobehavioral impairment was found in a study in the present issue by Yazdi, Sharifian, Dehghani-Beshne, Momeni, and Aminian, who found diminished psychomotor performance and memory associated with industrial exposure to airborne F in aluminum potroom workers in Iran.[4] Thyroid stimulating hormone (TSH) levels were determined in many of the same workers and found to be elevated in only 5% of them.[5] However, normal TSH levels do not necessarily always accurately reflect actual thyroid function. In a 2010 review of the molecular mechanisms of F toxicity, Barbier, Arreola-Mendoza, and Del Razo noted that F can induce oxidative stress and modulate intracellular redox homeostasis, lipid peroxidation, and protein carbonyl content, as well as being able to alter gene expression and cause apoptosis.[6] Genes modulated by F include those related to stress response, metabolic enzymes, the cell cycle, cell-cell communications, and signal transduction.[6] Activation of G-proteins by aluminofluoride complexes has been found to be central to F toxicity alongside microglial cell activation and the release of excitotoxic amino acids and proinflammatory cytokines.[7-9] Moreover, aluminofluoride complexes may also be involved in the F neurotoxicity experienced by aluminum potroom workers. The paper by Yazdi et al. underscores the importance of

neurobehavioral testing for early detection of cognitive impairment in potroom workers occupationally exposed to airborne F.

*Results from IQ studies:* Two other papers, both from dental schools, in this issue of *Fluoride* examine the effect of F in drinking water on IQ. In a study in Iran, Poureslami, Horri, and Garrusi found that the mean IQ score of 91.37 of 7–9 year-old children in a high F water (2.38 mg F/L [ppm]) city was lower ($p = 0.028$) than the mean IQ score of 97.80 in a low F water (0.41 mg F/L) city.[10] In the second study, conducted in India, Eswar, Nagesh, and Devaraj found that the mean IQ score of 86.3 for 12–14 year-old children in a high F water (2.45 mg F/L) village was not significantly different ($p = 0.30$) from the mean IQ score of 88.8 for children of the same age in a low F water (0.29 mg F/L) village.[11] Both studies had groups of a comparable size, 120 and 133, respectively, and nearly the same high and low water F levels. It is of interest, therefore, why one study found a statistically significant result but the other did not.

Similar pairs of examples can be found in the literature. In China, Xiang, Liang, Chen, Wang, Chen, Chen, and Zhou found, with a sample size of 512, that for 8–13 year-old children the mean IQ score of 92.02 in a high F water (2.47 mg F/L) village was lower ($p<0.01$) than the mean IQ score of 100.41 in a low F water (0.36 mg F/L) village.[12] In contrast, in an earlier study in China, Hu and Yu found, with a sample size of 379, that for 6–14 year-old children the mean IQ score of 85.15 in a high F water (7.00 mg F/L) village was not significantly different ($p>0.05$) from the mean IQ score of 84.90 in a low F water (0.8 mg F/L) village.[13]

*Confounding factors:* Confounding factors are defined as factors that are correlated with both the disease (lowered IQ) and with the exposure of interest (F). Few if any of the existing F-neurotoxicity studies have adequately considered confounding, and are therefore subject to potentially extreme biases that may invalidate their results. Almost all are cross-sectional studies, and many use group-level rather than individual-level measurements. Potential confounding factors that might be both associated with F exposure and be a recognized cause of brain dysfunction include lead, arsenic, methylmercury, polychlorinated biphenyls (PCBs), toluene, and low iodine.[14] Emerging neurotoxic substances include manganese and perchlorate.[14]

It is essential that the assessment of confounding factors be carefully detailed: which ones were considered, how were they measured and controlled for, what were the potential biases from inadequate adjustment, and what likely confounders were not assessed at all?

*Effect-modifying factors:* Effect-modifying factors are factors which are not correlated with a disease but may modify the effect the exposure of interest (F) might have on the disease (lowered IQ). Dietary protection from F toxicity may occur with a diet containing adequate amounts of protein, calcium, fruit, and vegetables. Fresh produce is a source of vitamin C, vitamin E, and various antioxidants that can ameliorate F toxicity. A higher parental socioeconomic status or educational level may tend, in various ways, to raise the IQ of a child.

Water hardness may be an ameliorating factor. Camargo found that the bioavailability of F ions in water organisms is reduced with increasing water hardness.[15] Jolly, Prasad, Sharma, and Chander found that there was less skeletal fluorosis in adult males in villages with comparable levels of water F when the magnesium (Mg) levels were higher.[16] Similarly, Pinet and Pinet found that skeletal

fluorosis in the Sahara was less when the Mg/Ca ratio was high compared with when it was low.[17] Maguire et al. found that the differences in F bioavailability between hard and soft waters were small compared with the large within- and between-subject variations in F absorption.[18] However, the artificially and naturally fluoridated hard and soft waters they studied differed in the levels of calcium carbonate present (artificial 382 and 50; natural 381 and 63 mg $CaCO_3$/L, respectively), and no Mg levels were reported. Thus, at least in some situations, the level of waterborne Mg appears to affect the toxicity resulting from a particular level of F. Other minerals that may possibly play a role in affecting toxicity include molybdenum, vanadium, strontium, selenium, copper, and boron.[19]

Elevation above sea level and latitude may also modify F toxicity. Higher altitudes have been associated with increased F toxicity.[20,21] Besides having children of different ages, the two IQ-F studies in this issue of *Fluoride* differ in the elevation where they were conducted. The Iranian study, which achieved overall statistical significance between the high and low F water communities ($p = 0.028$), was done in Kerman Province at 2200 and 2300 m above sea level. On the other hand, the Indian study, which did not show a statistically significant overall difference ($p = 0.30$), was conducted in the Davangere district of Karnataka at a lower elevation of 602 m above sea level. Some differences in latitude were also present (Koohbanan 31°31'N, Davangere district 14°31'N), and areas closer to the equator have more annual sunshine, thereby reducing the risk of vitamin D deficiency. Vitamin D, as is becoming increasingly apparent, may be protective against F toxicity.[22-24]

Depending on how those taking the tests are selected, and if the administration of the IQ tests is not blinded, the results can become biased.

When the effects of F in drinking water are being compared, other F sources also need consideration to avoid errors in the measurement of the F intake which may tend to obscure differences that may be present between the groups. Fluoride may come from food, brick tea,[25] smoke-polluted air, dental fillings, and dental sealants. Burning briquettes made with high-F clay-coal in a stove without a flue may result in the contamination of stored corn and chilies.[26]

*Are IQ-F studies inconclusive?* Although various studies indicate that F is neurotoxic, they are not always conclusive. For example, Li, Zhi, and Gao found, in 907 children aged 8–13, who varied in the amount of F they ingested from food contaminated with F from coal smoke, that, as the urinary F progressively increased from 1.02, 1.81, 2.01, to 2.69 mg F/L, the IQ scores progressively decreased from 89.9, 89.7, 79.7, to 80.3 ($p<0.01$ when comparing the combined non-fluorosis and slight dental fluorosis areas with the combined medium and severe dental fluorosis areas).[27] The threshold in this study for an adverse effect of F on IQ was a urinary F of 2.01 mg F/L. However, the study can be criticized on methodological grounds—e.g., various confounding factors, unconscious or inadvertent bias in the selection of subjects for IQ testing within each of the groups being compared, lack of detail on blinding in the IQ assessments, being cross-sectional, using an IQ test (the revised China Rui Wen's Scaler for Rural Areas) of uncertain validation, and not assessing F exposure from drinking water and air.

This cross-sectional ecologic study cannot give a definitive answer on its own as to whether F impairs brain function. If it is combined with many other studies, all pointing to the same result, and hopefully not all confounded, can one perhaps

conclude there is evidence that F is neurotoxic. Unfortunately, if there is a widespread confounder that might be biasing all the studies, then no matter how many studies show a correlation between F and IQ, they might all be biased and wrong. An example of this type of situation would be that if F intake delays tooth eruption then virtually all of the F-caries studies which have ignored eruption timing would be biased in a way to make it seem as if F was reducing caries, when in fact it was just delaying them.

A meta-analysis by Tang, Du, Ma, Jiang, and Zhou[28] of sixteen F-IQ studies found a mean weighted difference of 5 IQ points between the high and low F groups, although their conclusion that this represented a five times higher odds of developing low IQ has been challenged.[29]Another systematic review by Connett and Limeback searched 224 papers for relevancy from their titles, abstracts, and full copy.[30] They found that 20 met their inclusion criteria for being original human studies examining the effect of F on IQ. The authors considered that, while the evidence was not conclusive, there were 18 ecological studies that purported an association between high F exposure and decreased human intelligence.

However, as with several other toxic effects of F, it is well established, from animal studies and a few studies looking at the brains of aborted fetuses of mothers with dental fluorosis or both dental and skeletal fluorosis, that F can produce neurologic damage, especially developmentally.[31-34] Although it is laudable to be scientifically scrupulous and avoid making a connection between F exposure and neurotoxicity when in fact no such relationship exists (a false positive or Type I error), it is also necessary to avoid making a mistake in the opposite direction and incorrectly dismiss a situation where F exposure is causing impaired brain functioning (a false negative or Type II error). The critical questions are determining at what levels F is neurotoxic and whether or not there is a safe level below which no toxicity occurs. Even if the currently available studies are not able to provide definitive answers, it is of interest to examine them to see if they suggest the occurrence of a threshold for toxicity or if F, which is not an essential nutrient, is similar to lead, ozone, and ionizing radiation with the ideal dose being zero.

*Threshold for F neurotoxicity: (i) Possible threshold from a pool of eight studies.* Urine or serum levels of F provide a measure of the amount of F that has been absorbed from drinking water, air, food, and other sources. In the absence of other confounding factors, where comparable urine or serum levels of F are present, similar neurotoxic effects might be expected. Comparing average urine F concentrations and average IQs for groups is not ideal because overlap between the groups may be present resulting in an indistinct picture of the situation. Using individual data for IQ and urine or serum F levels is better than using group data. However, it is only possible to examine the data currently available.

In seven studies in which a significantly lowered IQ was associated with a higher water or food F level, the urinary F levels were 2.56, 2.69, 4.99, 3.47, 5.5–6.0, 6.13, and 5.1 mg F/L.[12,27,35-39] In a study which found no significant effect, the urinary F was 2.03 mg F/L.[40] A further study that reported that children from an area with severe endemic fluorosis had higher urine F levels compared with a control area and that "urine fluoride and intelligence showed a clear negative correlation" was difficult to interpret because a table in the paper showed the urinary F of children in the endemic zone (1.352 mg F/L) to be lower than that in the control zone (1.611 mg F/L), and it was stated that urinary F and intellectual ability were both lower in the fluorosis group

than in the control group.[41] This paper was excluded from further consideration. A study of women exposed to high F water during pregnancy whose babies had neonatal neurobehavioral impairment found a mean maternal urinary F level of 3.58 mg F/L.[42]

In summary, in eight studies showing a significant association between IQ or neonatal neurobehavioral impairment and water or food F, the urinary F levels were all above 2.5 mg F/L.[12,27,35-39,42] These data suggest that neurotoxicity from F is likely to occur when the total F intake from water, dietary, airborne, and other sources results in a urinary F level of approximately 2.5 mg F/L or more. However, it is possible, if other comparison groups had been studied, that an adverse effect of F on IQ may have been found in groups with a urinary F lower than 2.5 mg F/L. Similarly, if a study has a control group with a relatively high water F level, e.g., 2.01 mg F/L,[38] it will not be possible to determine if neurotoxicity might have occurred with lower levels of F in drinking water.

*(ii) Threshold from the study by Xiang et al.:* In a study that controlled for lead and iodine levels, Xiang et al. calculated that the threshold for neurotoxicity from F (the lower-bound confidence limit of the Bench Mark Concentration Level, BMCL), for 512 children aged 8–13, was a serum F concentration of 0.064 mg F/L and a drinking water F concentration of 1.85 mg F/L. [12] The mean urinary F level in the high F village of their study was 3.47 mg F/L and 1.11 mg F/L in the low-F village. A significant negative correlation was present between serum F and IQ in the high drinking water F village ($p = 0.015$). There was also a significant positive relationship between serum F and drinking water F ($p<0.001$).

*(iii) Threshold from the study by Ding et al.:* In their recent IQ investigation of 331 children, aged 7–14, Ding, Gao, Sun, Han, Wang, Ji, Liu, and Sun found a negative correlation between urine F and IQ when age was taken into account ($p<0.0001$).[43] With drinking water F ranging from 0.24 to 2.84 mg F/L (mean 1.31 mg F/L), their graph of differences of IQ scores from the mean value showed that IQ fell below the mean when the urine F concentration was 0.85 mg F/L or more.

The graph did not include information on the level of F in drinking water, but the paper gave the range for it as 0.24–2.84 mg F/ L. If it is assumed that the lowest urine F occurred in those with 0.24 mg F/L in their drinking water and the highest urine F occurred in those with 2.84 mg F/L, then the graph indicates that IQ fell below the mean with a drinking water F level of 0.81 mg F/L or more. Each increase in the urine F of 1 mg F /L was associated with a 0.59 decrease in the IQ score.

Although a significant negative correlation was present between IQ and urinary F, considerable overlap existed between the groups so that some in the highest urinary F group had higher IQs than some in the lowest urinary F group. It is only by making an assumption about which groups had the lowest and highest urinary F levels that an estimate can be reached of the drinking water F level (0.81 mg F/L) at which the IQ fell below the mean. However, the graph does not illustrate a true threshold effect below which IQ is not adversely affected. The IQ difference from the mean is 0.42 higher with a water F of 0.10 mg F/L compared to the IQ at a water F of 0.81 mg F/L. Thus the study by Ding et al. suggests that there is no safe threshold in drinking water below which F has no neurotoxicity.

*Application of a safety or uncertainty factor:* In order to allow for the large within- and between-subject variations in F absorption reported by Maguire et al.,[18] the differences in water consumption by individuals, and the presence of factors that

increase the sensitivity to F toxicity such as low iodine levels,[44] it is necessary to allow a safety or uncertainty factor for determining the appropriate urinary or serum F level in a population. Commonly a safety factor of 10 is used and applying this to the urinary F level of 2.5 mg F/L, found in the pool of eight studies to be associated with neurotoxicity, gives a value for a urinary F level unlikely to be associated with neurotoxicity of 0.25 mg F/L. An estimate of the level of F in drinking water likely to give a urinary F of 0.25 mg F/L can be made by considering the urinary F levels found in the children and mothers in the control areas in the pool of studies cited above.[12,27,35-39,42] These were 1.52, 1.02, 1.43, 1.11, 1.5, 2.30, 1.5, and 1.74 mg F/L. These values from the pool of eight studies are 6.08, 4.08, 5.72, 4.44, 6, 9.2, 6, and 6.96, respectively (mean 6.06) times higher than 0.25 mg F/L. The drinking water F levels were available from seven of the control areas[12,35-39,42] associated with these urinary F levels and were 0.34, 0.37, 0.36, 0.8, 2.01, 0.5, and 0.5–1.0 mg F/L compared to 0.88, 3.15, 2.47, 5.3 and 9.4, 5.55, 8.3, and 1.7–6.0 mg F/L in the study areas (no water value was available for the second control area[27] with a urine F of 1.02 mg F/L as the F source was clay-coal smoke). If each of the seven water F values from the control areas is divided by the number of times the associated urinary F value is greater than 0.25 the values obtained are 0.056, 0.065, 0.081, 0.133, 0.218, 0.083, and 0.043 mg F/L giving a mean of 0.097 mg F/L. Thus, from this pool of eight studies, it can be estimated that a drinking water F level of 0.10 mg F/L would be likely to produce a urinary F level of 0.25 mg F/L. However, this figure is an approximation, since it is likely that not all of the urinary F is derived from F in the drinking water and some may have come from food, brick tea, polluted air and other sources. If the non-water sources of F are unchanged, a greater reduction in the water F level would be required to produce a particular reduction in the urinary F level. Therefore the actual level of drinking water F likely to produce a urinary F level of 0.25 mg F/L might even be less than 0.097 mg F/L.

In summary, when a safety factor of 10 is used, the levels of F in drinking water that might protect all groups from neurotoxicity would be, from the pool of eight studies, 0.10 mg F/L and, from the study by Xiang et al., 0.185 mg F/L. The study by Ding et al. suggested that although the IQ began to fall below the mean with a drinking water F level of 0.81 mg F/L, there was no threshold and that the IQ would be 0.42 higher with a drinking water F level of 0.10 mg F/L compared to the IQ at 0.81 mg F/L in the drinking water. Thus, rather than applying a safety factor of 10 and obtaining an estimate of the level of F in drinking water that is likely to protect against neurotoxicity of 0.081 mg F/L, the Ding study suggests that the safest level of F in drinking water is zero.

The threshold value of 0.1 mg F/L derived from the pool of eight studies matches the prescient recommendation by Babbitt and Doland in 1939 to the American Water Works Association that the maximum level of F in drinking water should be 0.1 mg F/L because at least a tenfold margin of safety should be maintained.[45]

*Conclusion:* If the accumulated evidence of human neurotoxicity from F is viewed dispassionately, two conclusions can be drawn. Airborne F in industrial situations may pose a health risk to workers and may be detected by neurobehavioral testing. The studies currently available on the development of IQ all have their limitations, and although cases can be made, based on a pool of eight reports and a paper by Xiang et al., respectively, for levels of F in drinking water of 0.1 and 0.185 mg F/L being safe for all children, other evidence, from Ding et al., suggests that even a level as low as

0.081 mg F/L is not safe. Thus there is no threshold for F neurotoxicity in drinking water, and the only assuredly safe level is zero.

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# INTELLIGENCE QUOTIENTS OF 12–14 YEAR OLD SCHOOL CHILDREN IN A HIGH AND A LOW FLUORIDE VILLAGE IN INDIA

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**SUMMARY: The aim of this preliminary study was to compare the intelligence quotient (IQ) scores of 12–14 year old school children living in a high fluoride (F) village with the IQ scores of a similar group of children in a low F village in the Davangere district, Karnataka, India. Sixty-five children from the one high school in the low F water village of Ajjihalli (F = 0.29 ppm) and 68 children from the one high school in the high F village of Holesirigere (F = 2.45 ppm) were selected by convenience sampling. Water F levels were estimated by the F ion selective electrode method. IQ scores were measured using Raven's Standard Progressive Matrices test. Chi-square and Z tests were used for statistical analysis of data. In the high F village of Holesirigere the mean IQ score of the 68 children was lower (86.3±12.8) than in the low F village of Ajjihalli, where the mean IQ score of 65 children was higher (88.8±15.3), but the difference was not statistically significant (p = 0.30) The number of children with IQ scores < 90 was 43/68 (63.2%) in high F Holesirigere and 31/65 (47.7%) in low F Ajjihalli, a difference that is nearly but not quite statistically significant (p = 0.06). The trend was toward lower IQ with high F water, even though these preliminary findings indicated that the F level in the drinking water was not significantly associated with IQ scores of 12–14 year old children in the high and low F villages.**

Keywords: Davangere district; High fluoride village; Intelligence quotient; Karnataka state; India; Low fluoride village; School children.

## INTRODUCTION

Among various biological effects associated with fluoride (F), disturbances of normal neurological functions of the central nervous system are of great concern. F can penetrate the foetal blood brain barrier and accumulate in cerebral tissue before birth, thereby affecting intelligence.[1] Human studies conducted in different parts of China have indicated an association between high levels of drinking water F and a lower IQ in children.[2] In India children in high F areas have been found to have low IQ, deaf mutism, genu valgum, and genu varum.[3]

With the existence of widespread endemic fluorosis in India, the possible adverse effect of elevated F in drinking water on the IQ level of children is a potentially serious public health problem. Davangere district in Karnataka state, India, is considered to be naturally fluoridated area according to studies conducted by the Rajeev Gandhi National Drinking Water Mission, New Delhi.[4] Hence it provides what would appear to be an ideal locale to investigate the relationship between F level in drinking water and IQ of children. Since a review of the scientific literature indicated a relative scarcity of such studies in this region of

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India, a preliminary study was conducted to compare IQ scores of 12–14 year old schoolchildren living in a high and a low F village in this part of India.

## MATERIALS AND METHODS

The study was a cross-sectional comparison of the IQ scores of 12–14 year old school children living in the two villages Ajjihalli and Holesirigere in the Davanagere district of Karnataka, India. The plan of the study was reviewed and approved by the Institutional Ethical Committee. The selection of the two villages was based on difference in the level of F in the drinking water as reported by Chandrashekhar.[4] Both the villages had one high school each and had a common and stable public drinking water supply. The bore wells in the two villages were at least 12 years old according to the information supplied by the governing body of each village. The F content in drinking water was estimated by F ion Selective Electrode method. The low F village of Ajjihalli had a F level of 0.29 mg/L, and the high F village of Holesirigere had a F level of 2.45 mg/L.

As finally carried out, the study involved 133 children aged 12 to 14 years attending the government schools in the two villages. Permission was obtained from the school authorities and the parents to include the children in the study. The sampling methodology adopted was convenience sampling. Initially, 88 children in the low F village and 83 children in the high F village aged 12–14 years were available and screened for selection. Out of them, 65 children (33 males and 32 females) from the low F village Ajjihalli and 68 children (36 males and 32 females) from the high F village Holesirigere satisfied the criteria and were selected. Children who were continuous residents of the village since birth and children drinking water from the same public water supply were included in the study. All the children selected from each village were from the same high school. Children with a history of trauma or injury to the head, those affected by congenital or acquired neurological disorders, and psychological disorders, and, children who were absent on the day of survey were excluded from the study.

Data for each child's age, gender, duration of residency in the village, source of drinking water, and duration of using the water from that source were recorded on a specially designed form. The IQ of the children was measured using the Standard Progressive Matrices test (SPM) prepared by John C Raven.[5] Prior to administering the test, an explanation of the nature of the test and instructions were given to the children regarding the method of writing answers in the record form. The test was administered to each child in the study sample in groups of 20–23 in the school classroom under the supervision of the investigator. No chance for copying was allowed.

## RESULTS

The test results were analyzed using chi-square test and 'Z' test. A p value of less than 0.05 was set for statistical significance. The mean IQ of children from high F village Holesirigere was slightly lower (86.3±12.8) when compared to the mean IQ of children from low F village Ajjihalli (88.8±15.3). But the difference between the means was not statistically significant ($Z = 1.03$, $p = 0.30$, NS) (Table 1).

**Table 1.** Distribution of IQ scores of 12–14 year old children in the low and high F villages

| Village | No. of children | IQ 120–129 (superior) | IQ 110–119 (above average) | IQ 90–109 (average) | IQ 70–89 (below average) | IQ <70 (low) | Mean IQ (± SD) |
|---|---|---|---|---|---|---|---|
| Low F village (Ajjihalli) | 65 | 1 (1.5%) | 2 (3.1%) | 31 (47.7%) | 23 (35.4%) | 8 (12.3%) | 88.8 ± 15.3 |
| High F village (Holesirigere) | 68 | 0 | 2 (2.9%) | 23 (33.8%) | 38 (55.9%) | 5 (7.4%) | 86.3[a] ± 12.8 |

[a]Z = 1.03, p = 0.30 (not significant).

In the high F village, the proportion of children with IQ below 90, i.e., below average IQ, was larger (43/68 or 63.2%) compared to the low F village (31/65 or 47.7%), but the difference was not quite statistically significant ($\chi^2 = 3.25$, p = 0.06, NS) (Table 2).

**Table 2.** Number of children age 12–14 with IQ<90 and IQ≥90 in the low and high F villages

| Village | Children with IQ<90 N (%) | Children with IQ≥90 N (%) |
|---|---|---|
| Low F village (Ajjihalli) | 31 (47.7%) | 34 (52.3%) |
| High F village (Holesirigere) | 43 (63.2%) | 25[a] (36.8%) |

[a]$\chi^2 = 3.25$, p = 0.06 (not significant).

## DISCUSSION

As a preliminary study, the non-significant IQ differences reported between the high and the low F village should be viewed as tentative. Thus, although there was no statistically significant difference in the mean IQ scores of 133 children from the low and high F villages, it contrasts with the results of other studies, mostly in China and one from India, where significantly lower IQ scores correlate with higher F levels in the drinking water.[1,2,6-10] Though there was a trend in our study towards lower IQ in a greater number of children from high F village Holesirigere than in the low F village Ajjihalli, probably the small sample size of the present study failed to establish a statistically significant difference. The application of IQ tests to older children, i.e., at age 12–14, as opposed to younger, 6–8 year old

children may thus result in smaller, non-significant differences in IQ scores in the older children.

A principal basis for reduced intelligence in children exposed to high levels of F is the ability of F to cross the blood brain barrier, producing biochemical and functional impairment of the nervous system during prenatal and development periods of infancy and childhood.[2] IQ, however, is known to be influenced by many factors including differences in biological susceptibility, environmental conditions, and measurement errors.[11] Variables like nutrition, prenatal care, breast feeding, stimulating environment, parental IQ, endemic iodine deficiency,[12] freedom from disease, physical trauma, good schooling, and maternal exposure to F during pregnancy play a large role in determining IQ development. F in drinking water is therefore just one among these several environmental factors affecting the IQ of children.

In the present study, with the exception of factors like exposure to school environment, and freedom from physical trauma, the possible effects of the above confounding factors including the parental education and socio-economic differences between the villages were not taken into consideration. Consequently, explaining the IQ of children solely according to the effects of exposure to high or low F water is not possible.

The SPM test by Raven used to measure IQ of children[5] is a 'culture-fair' test which is suitable to compare people with respect to their immediate capacities for observation and clear thinking.[5] Though SPM test was designed to cover the widest possible range of mental ability, several possible shortcomings of the test need to be considered. The scores represent relative intelligence, not absolute intelligence.[5] Intelligence is an encompassing term that includes attributes such as creativity, persistent curiosity, logical reasoning, problem-solving skill, critical thinking, and adaptation. These different aspects of intelligence are independent of one another.

The SPM test measures only observation, clear thinking, and logical reasoning and hence it is a poor indicator of other attributes of intelligence.[5] One cannot get a balanced picture of an individual from the IQ test since other categories of IQ are not considered.

Apart from the shortcomings of the IQ test itself, other factors like emotional tension, anxiety, and unfamiliarity with the testing process can also greatly affect test performances. Considering these factors and the fact that this was a preliminary study done on a small scale, further investigation to clarify the nature of the relationship between fluoride and intelligence are clearly desirable.

## CONCLUSION

The findings of this preliminary study showed that F level in drinking water was not significantly associated with IQ level of 12–14 year old school children in a high and a low F village of the Davangere district, Karnataka, India. However, if systematically conducted large scale longitudinal studies prove that excess F in drinking water can adversely affect intelligence, then comprehensive measures

should be taken to reduce the exposure to excess F among pregnant women and children in endemic F areas.

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# A COMPARATIVE STUDY OF THE IQ OF CHILDREN AGE 7–9 IN A HIGH AND A LOW FLUORIDE WATER CITY IN IRAN

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**SUMMARY: A study was conducted to evaluate the effect of high and low fluoride (F) in the drinking water on the Intelligence Quotient (IQ) of young schoolchildren in two otherwise similar high-altitude communities in a mountainous region of Kerman Province, Iran. The study sample consisted of 120 boys and girls age 7–9: 60 in the city of Koohbanan (pop. 12,253; elev. 2200 m) with 2.38 ppm F in the water and 60 in the city of Baft (pop. 14,628; elev. 2300 m) with 0.41 ppm F in the water. Using a Persian version of Raven's Progressive Matrices Intelligence Test, the mean IQ scores of the children in low F Baft was 97.80±15.95, and in high F Koohbanan it was significantly lower at 91.37±15.63 (p = 0.028).**

Key Words: Baft, Iran; Children's IQ; Dental fluorosis; Fluoride in food; Fluoride intake; Iran; Intelligence quotient (IQ); Kerman Province, Iran; Koohbanan, Iran.

## INTRODUCTION

Besides dental and skeletal fluorosis, excessive fluoride (F) intake can also affect the central nervous system without first causing the physical deformities associated with skeletal fluorosis. Thus, as an extreme example, toxic neuronal injury in the form of tetaniform convulsions in a 12-year-old boy from ingestion of 1-ppm fluoridated drinking water was described in detail and found to subside with nonfluoridated water.[1] Over the last two decades more subtle injury from F in the form of lower intelligence has been reported in China,[2-7] India[8,9] and Iran.[10] In the present study, the effect of a high and a low fluoride drinking water on the Intelligence Quotient (IQ) of young school children in two otherwise similar mountainous communities of Kerman Province in SE Iran, has been investigated.

The high F (2.38 ppm) water city chosen for this study was Koohbanan,[11] population 12,253 in 2007, located 160 km north of the provincial capital Kerman at an elevation 2200 m above sea level with a mean annual temperature of 14.5°C. The low F (0.41 ppm) water city was Baft,[12] population 14,628 in 2007, located 280 km southwest of Koohbanan at an elevation 2300 m above sea level with a mean annual temperature of 14.0°C. In addition to these features, the two cities have a similar socioeconomic and cultural status and educational facilities. The number of children age 7–9 born and living in Koohbanan was recorded in 2007 as 595 and in Baft it was 621. As expected, the prevalence of dental fluorosis in Koohbanan is quite high but is comparatively low in Baft. In a recent study[11] we found the total 24-hr F intake among 4–5 year old preschool children in Koohbanan to be 1.71 mg.

## MATERIALS AND METHODS

Initially, the aims of the study were explained verbally to each parent and child, and an information sheet was also given to them. Before the test, they gave their written consent according to Ethical code K/88/48.

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Similar to the size of a recent IQ study in China,[6] the cluster randomized sample was 120 students 7–9 years old with 60 students selected from different schools in each of the high and low fluoride cities (Table1).

Exclusion criteria included genetic, congenital, or acquired diseases related to the nervous system, past or present. For the 60 students in Koohbanan, with 2.38 ppm F in the drinking water,[11] inclusive criteria included signs of grade III TSIDF (total surface index of dental fluorosis) or more, i.e., visible fluorosis on least two thirds of the labial surface of the maxillary permanent central incisors. In each case the examiner was one of the investigators. For the 60 students in the control city of Baft with 0.41 ppm F in the drinking water,[12] similar physical (same range of weight, height) and mental health (usual school, no history of mental disorders) criteria were adopted. However, these children lacked any sign of fluorosis on the labial surface of their permanent central incisors.

The Raven's Progressive Matrices Intelligence Test used in this study consists of a series of multiple choice tests (in Persian) of abstract reasoning, originally developed in 1936.The booklet comprises five sets (A to E) of 12 items each (e.g., A1 through A12), with items within a set becoming increasingly difficult, requiring ever greater cognitive capacity to encode and analyze information. The four first questions were explained to the child, and when the child understood how to answer, he or she was told to answer the remaining questions. The test was administered by a teacher who had been trained by a psychologist, and the Raven's scoring was calculated on the basis of the Persian version of the test.[13]

Intellectual ability ranking was as follows: IQ = 70–79 borderline, IQ = 80–89 below average, IQ = 90–109 average, IQ = 110–119 above average, IQ = 120–129 excellent, and IQ >129 superior. After the Raven's tests were completed in the two cities, the answer sheets were collected, tabulated, and evaluated. The data were then analyzed by SPSS v.13.0 software. Where appropriate, t test and Mann-Whitney test were used. Results are means and standard deviation. $P < 0.05$ was considered statistically significant.

## RESULTS

After the tests in the two cities were completed, the answer sheets were scored and the results tabulated as shown in Tables 1–3.

**Table 1.** Baseline characteristics of the study children and water F in Baft and Koohbanan

| City in Kernan Province | No. of girls (%) | No. of boys (%) | Total (%) | F in drinking water (mg/L) |
|---|---|---|---|---|
| Baft | 32 (51.61) | 28 (48.28) | 60 (50) | 0.41 |
| Koohbanan | 30 (48.39) | 30 (51.72) | 60 (50) | 2.38 |
| Total | 62 (100) | 58 (100) | 120 (100) | |

**Table 2.** Comparison of the IQ rankings the 7–9 year-old children in Baft and Koohbanan

| IQ rank | No. of Baft children (%) | No. of Koohbanan children (%) | Total Number (%) |
|---|---|---|---|
| Borderline | 12 (20) | 16 (27.12) | 28 (23.53) |
| Below average | 12 (20) | 17 (28.81) | 29 (24.37) |
| Average | 18 (30) | 15 (25.42) | 33 (27.73) |
| Above average | 8 (13.33) | 3 (5.08) | 11 (9.24) |
| Excellent | 10 (16.67) | 8 (13.56) | 18 (15.13) |
| Total | 60 (100) | 59 (100) | 119 (100) |

**Table 3.** Comparison of children's IQ by gender and city (values are mean± SD)

| Gender | Number | Baft | Koohbanan |
|---|---|---|---|
| Girls | 62 | 95.97±17.21 | 92.43±15.48* |
| Boys | 57 | 99.98±14.40 | 90.28±15.97† |
| Total | 119 | 97.80±15.95 | 91.37±16.63† |

*p>0.05 (NS); †p<0.05 (significant compared with the Baft scores).

One answer sheet from a Koohbanan was incomplete and therefore there are only 59 scores for that city.IQ scores in the range of average (90–109) occurred for 30.0% (18/60) of the students in low F Baft and 25.4% (15/59) of the students in high F Koohbanan. None of the students in either city had a superior IQ >129 (Table 2). The average IQ score of the 60 Baft students was 97.80±15.95, and the average IQ score of the 59 Koohbanan students was 91.37±15.63. This difference is statistically significant ($p = 0.028$). There was also a significant difference between the IQ of the boys in Baft and the boys in Koohbanan (Table 3). However, the IQ difference between the Baft and Koohbanan girls was not significant.

## DISCUSSION

The significantly higher mean IQ of the students in low F water Baft than in high F water Koohbanan agrees with findings of other F/IQ studies.[2-10] Thus, Liu et al., in comparing the lower IQ scores of 60 children age 10–12 in a high F water (3.15 mg/L) area with those of 58 control children of the same age in a nearby low F water (0.37 mg/L) area found "there were significantly more borderline and low IQs in the high F area (13/60) than in the low F area (2/58) ($p<0.01$)."[6] Similarly, in an earlier larger study, Chen et al. observed a significantly lower average IQ of 320 children age 7–14 in an area with 4.55 mg F/L in the drinking water compared to the IQ of 320 children of the same age born and residing in an area with 0.89 mg F/L in the drinking water ($p<0.01$).[2] In another early investigation, Guo et al. compared the IQs of 7–13 year-old children living in areas with and without endemic dental fluorosis and found a significantly lower IQ in the 7–9 year-old children in the endemic fluorosis area,[3] just as we have found in the current study. The standardized Raven's IQ test was used in the Liu and Chen studies, but in the

Guo study the Chinese Binet IQ test was used. In our study, in agreement these studies, the percentage of students ranked in the ranges of average, above average and excellent were higher in low F Baft than the percentage of students in the same ranks in high F Koohbanan. Likewise, the percentage of the students ranked in the ranges of below average and borderline were higher in Koohbanan than in Baft.

Our findings therefore support the view that exposure to elevated F can cause lower IQ. Koohbanan children living at high altitude as well as near mountain coal mining operations may have increased susceptibility to tissue hypoxia from excessive accumulation and harmful effects of F in those tissues.[3,14,15] Our findings also revealed a significant difference between the IQ of the Baft and Koohbanan boys, but this difference was not significant between the IQ of the girls. Although the Chen and Guo groups in their studies[2,3] did not make comparisons between IQ scores of boys and girls, their data indicate that the IQ difference between the girls was smaller than between boys in the same areas.

From all that has been reported, it is now clear that excessive intake of F can produce harmful effects on the developing brain,[16] the detailed mechanism by which F influences IQ is not known, and more studies in this area are needed. On the other hand, appropriate measures to remove F from the drinking water in Koohbanan is strongly recommended. There are also studies showing that children's IQ can also be affected by high waterborne concentrations of arsenic,[17,18] but we have not found any report about the amount of arsenic in the Koohbanan drinking water, nor have we been able to measure it. It should also be noted that there are other confounding variables including genetic, nutritional, and other toxic environmental factors such as lead that can potentially influence IQ. In addition, measurement errors due to limitations of IQ tests need to be considered.

Based on our findings, chronic exposure to high levels of F definitely appears to be one of the factors that can decrease the IQ of children.

## ACKNOWLEDGEMENT

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# Trace amounts of cancer-causing chemical found in San Jose recycled water

By Paul Rogers progers@mercurynews.com

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In a potential setback for efforts by the Santa Clara Valley Water District and the city of San Jose to expand the use of recycled water in Silicon Valley, tests found that trace amounts of a chemical suspected to cause cancer appear to have spread from recycled water used in an irrigation project into shallow groundwater.

The study, funded by the water district, began in September 2008 at Integrated Device Technology, a semiconductor company in South San Jose, and continued for 18 months. Researchers irrigated grass on the company's property with recycled water and found that small amounts of NDMA, a chemical that is created as a byproduct of disinfecting water with chlorine, seeped into shallow groundwater

The researchers tested the groundwater beforehand and did not find the chemical.

Roughly 5 percent of the water that the water district currently provides to San Jose and other communities comes from filtering, cleaning and treating sewage to high levels so it can be used again as irrigation water. The district and the city of San Jose are building a $50 million advanced treatment plant with the goal of doubling the use of recycled water and, more controversially, blending it with existing groundwater sources now used for drinking.

Don Gage, chairman of the water district board, said Tuesday that he is closely following the study, and the final five-volume version is due out in July. But he said the preliminary findings aren't a death

knell for the recycled water expansion efforts.

"I'm always concerned about any contaminants that are in the water," said Gage. "My understanding, though, is that it doesn't exceed the state standard."

The EPA has not set a maximum level for the chemical in drinking water, although California has a "public health goal" of 3 parts per trillion. The study found levels of 3 to 4 parts per trillion down to 30 feet in the groundwater at the site at 6024 Silver Creek Valley Road, but did not test deeper aquifers to see if it had migrated lower.

Gage also noted that NDMA can be removed through various techniques at the treatment plant, including reverse osmosis -- a process where water is forced through tiny filters and membranes -- as well as treatment with ultraviolet radiation.

The detection of the chemical in the shallow groundwater showed that soils in that part of San Jose don't filter the chemical, the study concluded. Although Silicon Valley gets roughly half of its drinking water from underground wells, those are deep underground. Nobody drinks the shallow groundwater, which often contains other contaminants, including fertilizer, and oil that can wash off roads.

"I don't know that it came from the water," Gage added. "They could have put fertilizer on the ground or anything. We know there's a problem, but we need to learn more. If it is in the recycled water, we have to find a way of removing it or else people won't accept it. They aren't going to use water or drink water that has a carcinogen in it."

NDMA is classified as a suspected human carcinogen by the U.S. Environmental Protection

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Agency. A water-soluble, yellowish liquid, it was once used in rocket fuel, but is no longer manufactured. Instead, it turns up occasionally as a byproduct of water disinfection using chlorine. It is also found in small amounts in cured meat, fish, beer and tobacco smoke.

Tests have shown that the chemical causes liver tumors in lab rats.

Joan Maher, deputy operating officer for water supply for the district, said that the district has not tested for NDMA in other locations where recycled water has been used for irrigation in the past decade. A 2007 study by the U.S. Geological Survey of seven local groundwater wells did not detect it.

Environmentalists said the issue is of concern, but ultimately solvable.

"NDMA is a pretty potent chemical at very low levels. It is not uncommon to detect it in wastewater," said J ennifer Clary, policy analyst with Clean Water Action, an environmental group in San Francisco.

"I'm thrilled they are finding it at an early stage so they can reverse course and fix it. They are going to have to do additional treatment, which is good because you are going to get cleaner water. But that comes at a cost."

**Contact Paul Rogers at 408-920-5045.**

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## NEUROTOXICITY AND NEUROBEHAVIORAL EFFECTS

The committee also cited research indicating adverse health effects such as lower IQ in children, behavioral, and histopathological changes in the brains of laboratory animals (some of these resembling the brains of Alzheimer's patients), cerebral impairment of humans, and enhancement of effects in the presence of aluminum. The report concludes: "fluorides have the ability to interfere with the functions of the brain and the body by direct and indirect means." It also noted that many of the adverse effects of fluoride can be attributed to the formation of aluminum-fluoride complexes. The report provides a wealth of information showing the negative effects of fluoride on the brain but is often unduly cautious in drawing the appropriate conclusions. The summary[24] states: "A few epidemiological studies of Chinese populations have reported IQ deficits in children exposed to fluoride at 2.5 to 4 mg/L in drinking water." This information is said to "lack sufficient detail to fully assess their quality and relevance to US populations." However, the results are significant enough to "warrant additional study."

The report goes on to identify "a few animal studies" reporting alterations in the behavior of rodents. Limiting the impact of this statement, the committee concluded that the changes were not "substantial." They list "molecular, cellular, and anatomical changes in the nervous system . . . suggesting that functional changes could occur." More research is urged to "clarify the effects . . . on brain chemistry and function." Of particular concern is their statement: " . . . histopathological changes similar to those traditionally associated with Alzheimer's disease in people have been seen in rats chronically exposed to AlF [sic] (Varner et al. 1998)."[25]

Given these and many other examples, there is little doubt that fluoride affects the brain and that it enhances the uptake of aluminum in the brain. Human observations support the conclusion of brain effects, and animal studies allow dose levels causing these effects to be estimated for the purposes of developing an MCLG.

Exposure figures mentioned in this and other sections of the report often give only animal data. However, the committee suggested a way to convert such data to human exposures.[26] Apparently rats require 5 times the daily dose required by humans to arrive at the same serum concentrations. Thus, rats exposed to fluoride at 5 mg/L would achieve the same serum fluoride concentrations as humans exposed to 1 mg/L.

As noted in the report,[27] rats administered $AlF_3$ in drinking water at 0.5, 5.0, and 50 mg/L for 45 weeks (approximately 60% of $AlF_3$ is fluoride), all had significant damage in the hippocampus. An unusual number of deaths occurred at the lowest dose tested. A repeat of the test comparing $AlF_3$ at 0.5 mg/L and NaF at 2.1 mg/L for a test period of one year found that 6 out of 9 animals died in the $AlF_3$ group, 3 out of 9 of the NaF group died, and only 1 out of 9 control animals died. Both treated groups had twice as much aluminum in their brains as control animals. Leaving aside the unexplained deaths, there was a proven increase of $AlF_3$ in the brain with both $AlF_3$ and NaF, and significant damage to the brain at the low dose of 0.5 mg $AlF_3$/L, or approximately 0.3 mg F/L.

Two other studies were noted to have found the same pattern of neuronal degeneration. Thus, there exists a lowest observed effect level of 0.06 mg/L of

fluoride to develop an MCLG using the preventative approach of the Safe Drinking Water Act as mentioned earlier. (This figure of 0.06 mg/L is derived from the above 0.3 mg/L concentration of fluoride divided by the conversion factor for rats to humans of 5.) An appropriate safety factor does not have to be mentioned to see clearly that fluoridation at 1 mg/L cannot be considered acceptable for an MCLG.

## CONCLUSIONS

The NRC committee's reevaluation of EPA's MCLG for fluoride in drinking water failed to identify a safe level of fluoride in drinking water. This failure can be attributed to misdirection by EPA of the intended goal of the effort. When the committee requested and received a change in its mandate from evaluating the MCL to the MCLG, EPA strangely omitted the key scientific criteria necessary for evaluating this standard. The committee should have been told to look for health effects that "can be reasonably anticipated, even though not proved to exist." As a result of this omission, the NRC panel focused only on end points that were totally certain and concluded that the current standard of 4 mg/L did not protect against bone fractures and severe dental fluorosis. For the first time in history, a committee of the NRC removed severe dental fluorosis from the benign category of cosmetic effects and added it to the list of adverse health effects. In addition, Stage II skeletal fluorosis was added to the list, but the committee was unable to state with absolute certainty that this was occurring at the current EPA standards.

This review applied the necessary criteria to some but not all of the adverse health effects discussed in the NRC report. The results are as follows:

1. Moderate dental fluorosis is an adverse health effect occurring at fluoride levels of 0.7–1.2 mg/L, the levels of water fluoridation.

2. The Lowest Observed Adverse Effect Level (LOAEL) for bone fractures is at least as low as 1.5 mg/L and may be lower than this figure.

3. Stage II and Stage III skeletal fluorosis may be occurring at levels less than 2 mg/L.

4. Stage I skeletal fluorosis, (arthritis, clinically manifested as pain and stiffness in joints) is an adverse health effect which may be occurring with a daily fluoride intake of 1.42 mg/day, which is less than the amount the average person already obtains in their diet in non-fluoridated areas. The Maximum Contaminant Level Goal (MCLG) should be zero.

5. Decreased thyroid function is an adverse health effect, particularly to individuals with inadequate dietary iodine. These individuals could be affected with a daily fluoride dose of 0.7 mg/day (for a "standard man"). Since this is less than the amount already in the diet, the MCLG should be zero.

6. Fluoride has adverse effects on the brain, especially in combination with aluminum. Seriously detrimental effects are known to occur in animals at a fluoride level of 0.3 mg/L in conjunction with aluminum. The goal for this effect should also be zero.

The committee should be applauded for their efforts in general and in particular for ignoring directives not to include discussions of water fluoridation and silicofluorides. Their recommendations for research should be taken seriously. EPA has sufficient information in this report to act immediately, using the appropriate criteria set forth in the Safe Drinking Water Act. Using the preventive public health intent of the law, the Maximum Contaminant Level Goal for fluoride in drinking water should be zero.

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## Recommended – Water Research Reading


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## Arsenic carcinogenesis in animals

Until recently, inorganic arsenic in rodents was generally not carcinogenic except in model systems involving co-administration with known carcinogenic agents (Germolec et al. 1998; Rossman et al. 2004). However, a series of studies from our laboratory [for review, see Waalkes et al. (2007)] has recently demonstrated that inorganic arsenite administered during the second half of gestation to pregnant mice of several strains will induce or impact the development of cancer in the offspring as adults in various tissues, including tissues that are potential human targets such as liver and lung. In studies using prenatal arsenic exposure combined with exposure to additional agents after birth, tumors of the urinary bladder can also be induced. Together these studies provide consistent evidence that *in utero* arsenic is carcinogenic in mice and targets several tissues that are concordant with human target sites.

However, prostate cancers do not develop in these mouse studies (Waalkes et al. 2007). In this regard, the genetically unaltered mouse is not the rodent of choice for *in vivo* models of human prostate cancer (Shirai et al. 2000). The reasons for this include the observation that mice are resistant to the induction of prostatic tumors by chemical carcinogens as well as differences in anatomy and pathophysiology (Shirai et al. 2000). Transgenic mouse lines are available in which prostate carcinomas preferentially occur (Green et al. 1998; Shirai et al. 2000), but arsenic has not been tested in these models. Rats generally are considered a better rodent model of prostate cancer because prostate lesions can be chemically induced and in the early stages are androgen dependent (Shirai et al. 2000). However, arsenic bio-kinetics in rats is very dissimilar to that in humans or mice, and rats are considered a poor model for human arsenic toxicology (Aposhian and Aposhian 2006). Furthermore, although pentavalent methylated arsenicals are complete carcinogens and tumor promoters in rats (Wanibuchi et al. 2004), they do not target the prostate. Thus, at present, whole rodent prostate models of inorganic arsenic carcinogenesis are not available.

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## Arsenic Exposure and Human Prostate Cancer

The first evidence that inorganic arsenic was associated with prostate cancer in humans came from Taiwan in the late 1980s (Chen et al. 1988; Table 1). This was a follow-up study that focused on dose–response relationships between arsenic and cancer in a population exposed to high levels of arsenic in the drinking water from local artesian wells. The population studied was from the area of endemic "blackfoot" disease in southwest Taiwan, a disease involving the peripheral vascular dysfunction likely due, at least in part, to arsenic exposure (Chen et al. 1985). Although the original study had not looked at cancer of the prostate (Chen et al. 1985), the subsequent study found a remarkable association between arsenic exposure and prostate cancer mortality in this population (Chen et al. 1988). In this regard, the age-standardized mortality from prostate cancer in the group exposed to the highest levels of arsenic in the drinking water (≥0.60 ppm) was nearly 6-fold greater than that of the general population in Taiwan. In addition, when drinking-water arsenic levels were stratified (< 0.30 ppm, 0.30–0.59 ppm and ≥0.60 ppm), a significant dose–response relationship occurred between arsenic level and age-adjusted prostate cancer mortality. The exposed population lived in a relatively small area and had similar lifestyles, diets, living conditions, and sociodemographic characteristics compared with those of nearby unaffected villages, prompting the authors to conclude that the striking differences in cancer mortality between these groups could be explained "solely by the difference in arsenic concentrations in drinking water" (Chen et al. 1988).

Table 1
Epidemiologic studies of arsenic exposure and prostate cancer in humans.

# The Alliance For A Clean Environment

[illegible]



## Chlorine, Human Health. and the Environment: The Breast Cancer Warning

A Greenpeace Report
1993

What causes cancer?
chemical exposure
are children at risk?
hormone disruptors
breast cancer report
alteration statistics
breast cancer stats

An emerging body of evidence suggests that contamination of the environment with chlorine-based synthetic chemicals may be an important factor in the epidemic of breast cancer taking place across the world.

These chemicals-called organochlorines-are building up absolutely everywhere on the planet-in the air and water, in the food chain, in the tissues of wildlife, and in our own bodies. Universal organochlorine contamination has already been implicated in regional and global disease epidemics in people and wildlife, including impaired reproduction, development, immune function and behavior. The new evidence that now links these chemicals to breast cancer reinforces the fact that organochlorines pose a serious threat to human health and the environment and should be phased out.

Acrobat Reader

Organochlorines are by no means the only risk factor for breast cancer, and their role in incidence of the disease has not yet been proven, beyond a doubt, according to strict scientific standards. But the evidence is strongly suggestive, and it is not practical, responsible, or ethical to wait for proof before taking action to protect women's health. Enough is known now about the effects of organochlorines on human health to justify preventive action now.

Contact Congress

Enter your ZIP code and contact your representatives

Enter your ZIP code and contact your representatives

### The Breast Cancer Epidemic

In virtually every nation in the world, breast cancer incidence is rising, especially among older women. Since about 1930, the disease has been increasing steadily at a rate of 1 to 2 percent annually in industrialized countries. These increases are mirrored by rising rates of many other cancers. More recently the breast cancer epidemic has spread to developing nations, as well.

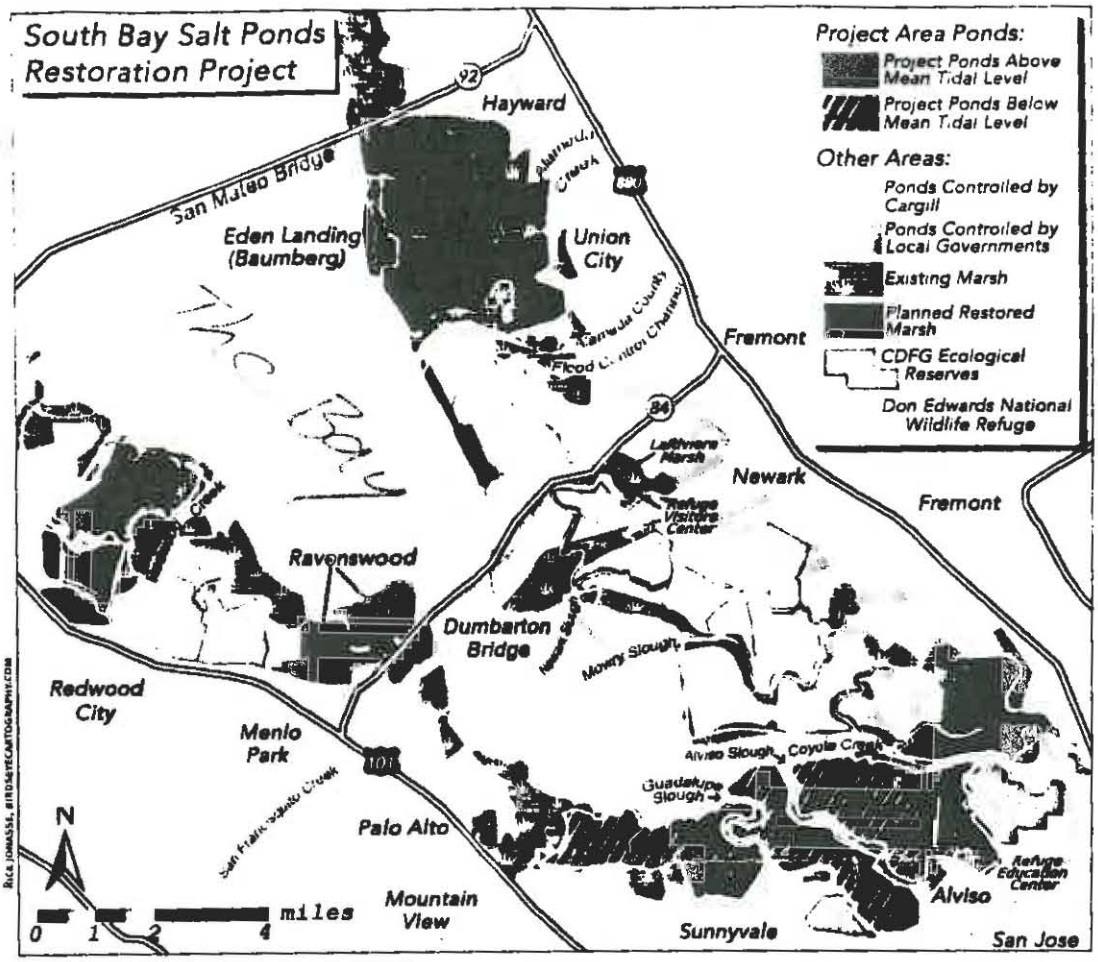
In the last decade, breast cancer incidence in many nations has shot up even more rapidly, increasing by 4 percent annually in the U.S., making breast cancer now the most common of all cancers among women. In many developing nations, incidence rates of the disease have begun to increase, as well. By the year 2000, breast cancer is expected to kill 1 million women each year.

### Breast Cancer Risk Factors

Recognized risk factors for breast cancer-genetic inheritance, reproductive and hormonal factors, and diet-account for an estimated 20 to 30 percent of all breast cancer incidence. Other factors, including alcohol consumption and exposure to radiation from nuclear tests and mammograms, also appear to play a role, but the majority of breast cancer remains unexplained.

There is clearly a relationship between sex hormones-especially elevated levels of estrogen-and increased breast cancer risk. Further, the types of breast cancer rising most rapidly are those that respond to estrogen. Changes in reproductive behavior and other hormonal factors-number of children and age at first and last childbirth, use of contraceptives and estrogen replacement therapy, for example-account for a portion of breast cancer risk but do not explain changes in hormonal status that would lead to the large-scale increases in breast cancer that are taking place. Exposure to industrial chemicals, including organochlorines-some of which mimic or interfere with the action of natural hormones-may explain some of the increase.

The role of dietary fat in breast cancer risk is controversial. Nations with high per capita fat intake also have high breast cancer rates, and increased fat consumption seems to be associated with modest increases in breast cancer risk. But fat consumption tends to rise with the degree of industrialization, pollution, and other confounding factors; correlations of national fat intake and breast cancer rates may indicate an underlying cause other than the




Reyes Bird Observatory, indicates the ponds are not merely convenient habitat for shorebirds; they are absolutely essential.

The ponds, says Warnock, provide critical foraging habitat and shelter for at least 20

say its supporters, their concerns must be addressed. Recreation is a case in point.

"These restored lands will be an oasis in an urban landscape, a tremendous source of solace for many people," says Morris. "So providing

A joint task force also tackled the issue of to work."

rather than swamping houses, offices, and communities.

There are other challenges to meet in restoring these ponds, among them exotic species. The Bay is hardly a pristine system. Hitchhiking opportunists from around the globe have displaced indigenous species. Oyster drills, Manila clams, and Asian clams have supplanted native mollusks. Mitten and green crabs are competing with hometown Dungeness and red rock crabs. In any restoration scenario, exotics constitute a potential wet blanket.

Bicyclists on the Bay Trail nee Pond A12 in Alviso ride by the clamshell dredge used by ear to maintain the salt pond rev

Among Morris's most significant concerns is the eastern red fox, a canid that is far more disposed than the smaller native gray fox to fo age in wetland areas. When the red foxes come in, the rails disappear, he observes.

More problematic than the fox, even, is Atlantic cordgrass— *Spartina alterniflora*— an its numerous hybrid forms. It differs from the native West Coast cordgrass, *Spartina foliosa*.

## We've Got What It Takes To Treat 30 Million Gallons Per Day

*It takes a lot of things to treat the 30 million gallons of wastewater USD receives every day! Here are some highlights of what we use at our treatment plant during our 24/7 operations:*

1,100,000 gallons of water - *97% of which is recycled.*

53,000 kilowatt hours of electricity - *about 2,120 times what is used in a typical home. We produce 30% of our electricity ourselves, decreasing our daily bill from $4,745 to $3,650.*

1,200 gallons of chlorine bleach solution *to disinfect the treated wastewater. Our bleach is about 2.5 times stronger than Clorox.*

764 miles of pipeline *to get the wastewater from all the homes and businesses to USD.*

450 gallons of polymer chemicals *to improve treatment efficiency.*

1,500 gallons of Ferrous Chloride - *a purplish-brown liquid containing lots of iron - to reduce corrosion and improve treatment.*

# Treated sewage still contaminated

## Threat to human, environmental health called questionable

**By Douglas Fischer**
STAFF WRITER

ALAMEDA — Chemicals suspected of interfering with hormone systems in humans and wildlife are leaching out of consumer products and into wastewater, where they end up in the Bay and beyond, according to a report released Wednesday.

The bulk of the pollution appears to be trapped by sewage treatment plants, designed to strip bacteria, sediments and metals from wastewater but not these so-called endocrine-disrupting compounds.

What does escape is both well-studied and inconsequential, countered industry representatives on Wednesday. The compounds are rapidly broken down in waterways and pose no threat to humans or wildlife, they said.

"What you've got is a triumph of analytical chemistry, that we can measure things this low," said Marian Stanley, senior director of the American Chemistry Council, which represents chemical manufacturers.

Contamination found in treated effluent, she added, "doesn't meet any environmental criteria" for harm. "This is a non-event."

The report was compiled by the Environmental Working Group with assistance from the East Bay Municipal Utility District. It tested raw sewage and treated effluent for the presence of three common chemicals thought to meddle with hormonal systems: Phthalates, bisphenol-a, and triclosan.

Phthalates and bisphenol-a are common plastic additives; the former are often used to soften plastics or bind fragrances, the latter to make plastic shatterproof and extend the shelf life of canned food. Triclosan is the active ingredient of many anti-bacterial soaps, toothpastes, dish detergents, even anti-mildew bath mats and odor-eating shoe insoles.

Sewage samples came from [illegible] homes, a coin-operated laundry, a diaper service, a hospital, and various manufacturers. Analysts found at least one of the three compounds in 15 of the samples.

LAURA A. OBA — Staff

**FRANCOIS RODIGARI,** Laboratory Supervisor at EBMUD, shows how the liquid extractor works that tests the water.

The study also examined three samples of treated effluent destined for the San Francisco Bay from EBMUD's Oakland water treatment plant. All three contained the compounds but at considerably lower levels.

"We know it's going in, we know at least some of it is going out, and we know that's not good," said Bill Walker, Environmental Working Group's West Coast president.

But Steve Hentges, director of the American Plastic Council's polycarbonate business unit, countered that effects at concentrations found in the treated effluent — in many cases, below 1 part per billion — are well known and "far below" the level that can cause harm to aquatic species.

The state, meanwhile, doesn't know what to make of the data. More than 22 million Californians drink water from the Sacramento and Colorado rivers, "receiving bodies," in water speak, for treated sewage from Sacramento, Las Vegas and numerous other communities. Yet water districts in California are not required to monitor for any endocrine-disrupting compound except [illegible] chlorate, an ingredient in [illegible]

"It is difficult to test for endocrine (disrupting compounds)," said California Department of Public Health spokeswoman Lea Brooks. "We have insufficient information regarding how much — if any — of these chemicals make it through the wastewater treatment process, natural degradation, and drinking water treatment."

The results come as new science buttresses the notion that these chemicals, in minute amounts and particularly when mixed together, pose a threat to our health.

The bottom line, say those involved in the study, is the need for a comprehensive chemical policy that keeps potentially harmful compounds out of products and encourages less-toxic alternatives.

"Treatment plants, frankly, for not being designed to remove these types of compounds, do a pretty good job," said Ben Horenstein, EBMUD's environmental services director.

"That said, the Bay is impaired. From a national policy perspective, from a state policy perspective, let's really think about what we're doing to our environment and putting down the drain.

It doesn't take a lot to potentially interfere and cause endocrine-disrupting events in an aquatic environment."

Contact Douglas Fischer at dfischer@[illegible]newspapers.com or at [illegible]

## The chemicals

**PHTHALATES:** A family [illegible] chemicals used to make pla[illegible] and vinyl soft and flexible ar[illegible] to bind synthetic fragrances [illegible] inks and colors to other con[illegible] pounds, such as cosmetics [illegible] Phthalates are ubiquitous in [illegible] environment yet break down [illegible] readily. Exposure is linked t[illegible] male reproductive system p[illegible] lems.

**BISPHENOL-A:** An addit[illegible] originally developed as a sy[illegible] thetic version of estrogen, u[illegible] to make plastic shatterproof [illegible] and to extend the shelf life o[illegible] canned food. Many studies f[illegible] a wide array of adverse healt[illegible] effects at low levels, particula[illegible] to exposure in the womb.

**TRICLOSAN:** The active i[illegible] gredient in most anti-bacteri[illegible] soaps and detergents, anti-g[illegible] givitis toothpastes, and odor-[illegible] eating shoe insoles. Classifie[illegible] as a "possible" carcinogen b[illegible] the International Agency for R[illegible] search on Cancer. Found to [illegible] cause thyroid disruption in [illegible] frogs at low levels.

## The products

**PHTHALATES:** Found in perfumes, cosmetics, lotions and other personal care products containing the word "fragrance" in the ingredient list; nail polish; flexible polyvinyl chloride (PVC) plastics, including some toys, IV tubing and building products; adhesives, inks, pill coatings and some detergents.

**BISPHENOL-A:** Used to make polycarbonate, or "shatterproof," plastic, including hard plastic water and baby bottles; plastic silverware; Lexan products; "No. 7" plastic; plastic linings in food and beverage cans; some dental sealants.

**TRICLOSAN:** Added to most anti-bacterial products, including hand soap, detergents, "anti-gingivitis" toothpaste, cleaning products, shoe insoles, plastic cutting boards, bath mats. Most products containing Triclosan list it under the [illegible]

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# First Direct Link Found Between Bacteria In Drinking Water And Stomach Ulcers

*ScienceDaily (Jun. 9, 1999)* — Harrisburg, PA -- Penn State Harrisburg researchers report they have found the first direct link between the presence of a bacterium in Pennsylvania drinking water and stomach ulcers.

*See also:*

**Health & Medicine**
- Gastrointestinal Problems
- Heartburn
- Infectious Diseases

**Plants & Animals**
- Drought
- Bacteria
- Beer and Wine

**Reference**
- Pathogen
- Peptic ulcer
- Ulcer
- Escherichia coli

The research team headed by Katherine H. Baker, assistant professor of environmental microbiology, revealed this week it has tied Helicobacter pylori in well water and clinical infection in persons drinking from that supply. Helicobacter pylori is an organism linked to the cause of at least 75 percent of all stomach ulcers and two types of stomach cancers.

The Penn State Harrisburg researchers made the association between water containing H. pylori and the infection through tests of private wells supplying drinking water to individual households. Interviews with residents who consumed the water found a statistically significant correlation between presence of the bacterium and cases of stomach ulcers.

Baker said drinking water is generally considered safe when coliform bacterium is not present. But the ulcer-causing bacterium was found in coliform-free water samples, she added. "What this really means is that our current methods for testing drinking water may be saying that water is fine while H. pylori may actually be present," she said.

The research findings, released at a meeting of the American Society for Microbiology in Chicago, was described by the team as the first to "demonstrate a direct link between contaminated drinking water and stomach ulcers." Baker said the study involved private, untreated water supplies and not municipal water sources, which are less likely to contain the organism

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Print Answer

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## Radon in drinking water is a health concern

Question

Why is radon in drinking water a health concern?

Answer

Radon gas decays into radioactive particles that can get trapped in your lungs when you breathe it. As they break down further, these particles release small bursts of energy. This can damage lung tissue and increase the chances of developing lung cancer over the course of a lifetime. People who smoke have an even greater risk. Not everyone exposed to high levels of radon will develop lung cancer. However, radon in indoor air is the second leading cause of lung cancer. About 20,000 deaths a year in the U.S. are caused by breathing radon in indoor air. Only about 1-2 percent of radon in the air comes from drinking water. However breathing radon released to air from tap water increases the risk of lung cancer over the course of your lifetime. Some radon stays in the water; drinking water containing radon also presents a risk of developing internal organ cancers, primarily stomach cancer. However this risk is smaller than the risk of developing lung cancer from radon released to air from tap water. Based on a National Academy of Sciences report, EPA estimates that radon in drinking water causes about 168 cancer deaths per year: 89% from lung cancer caused by breathing radon released to the indoor air from water and 11% from stomach cancer caused by consuming water containing radon. Additional information on radon in drinking is available at www.epa.gov/safewater/radon/proposal.html.

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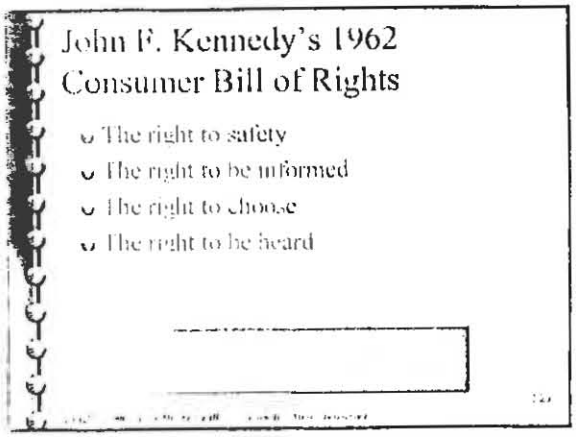

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|---|---|---|---|---|
| | | | present). Higher turbidity levels are often associated with higher levels of disease-causing microorganisms such as viruses, parasites and some bacteria. These organisms can cause symptoms such as nausea, cramps, diarrhea, and associated headaches. | |
| Viruses (enteric) | zero | TT[3] | Gastrointestinal illness (e.g., diarrhea, vomiting, cramps) | Human and animal fecal waste |

## Disinfection Byproducts

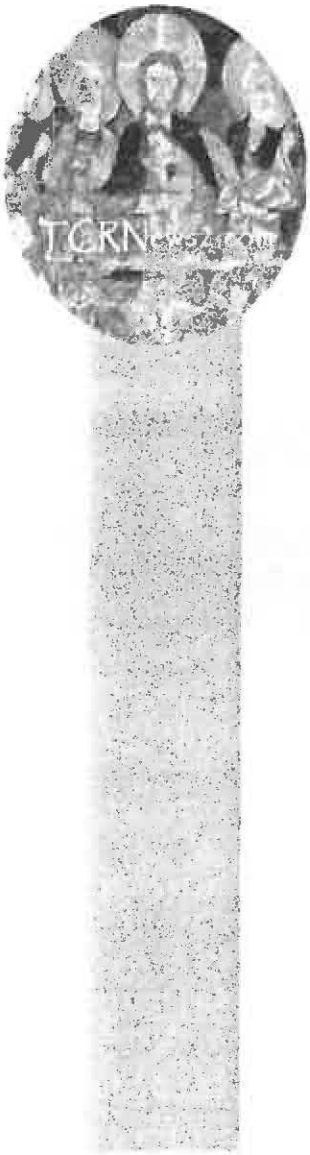
| Contaminant | MCLG[1] (mg/L)[2] | MCL or TT[1] (mg/L)[2] | Potential Health Effects from Ingestion of Water | Sources of Contaminant in Drinking Water |
|---|---|---|---|---|
| Bromate | zero | 0.010 | Increased risk of cancer | Byproduct of drinking water disinfection |
| Chlorite | 0.8 | 1.0 | Anemia; infants & young children: nervous system effects | Byproduct of drinking water disinfection |
| Haloacetic acids (HAA5) | n/a[6] | 0.060 | Increased risk of cancer | Byproduct of drinking water disinfection |
| Total Trihalomethanes (TTHMs) | none[7] / n/a[8] | 0.10 / 0.080 | Liver, kidney or central nervous system problems; increased risk of cancer | Byproduct of drinking water disinfection |

## Disinfectants

| Contaminant | MRDLG[1] (mg/L)[2] | MRDL[1] (mg/L)[2] | Potential Health Effects from Ingestion of Water | Sources of Contaminant in Drinking Water |
|---|---|---|---|---|
| Chloramines (as $Cl_2$) | MRDLG=4[1] | MRDL=4.0[1] | Eye/nose irritation; stomach discomfort, anemia | Water additive used to control microbes |
| Chlorine (as $Cl_2$) | MRDLG=4[1] | MRDL=4.0[1] | Eye/nose irritation; stomach discomfort | Water additive used to control microbes |
| Chlorine dioxide (as $ClO_2$) | MRDLG=0.8[1] | MRDL=0.8[1] | Anemia; infants & young children: nervous system effects | Water additive used to control microbes |

## Inorganic Chemicals

| Contaminant | MCLG[1] (mg/L)[2] | MCL or TT[1] (mg/L)[2] | Potential Health Effects from Ingestion of Water | Sources of Contaminant in Drinking Water |
|---|---|---|---|---|




# Agenda 21 --Reduction of world population by 80-90%

*". . population growth rates have been declining globally, largely as a result of expanded basic education and health care. That trend is projected to lead to a stable world population in the middle of the twenty-first century... The current decline in population growth rates must be further promoted through national and international policies that promote economic development. social development, environmental protection, and poverty eradication, particularly the further expansion of basic education, with full and equal access for girls and women, and health care, including reproductive health care, including both family planning and sexual health, consistent with the report of the International Conference on Population and Development.--- UN document S/19-2. Programme for the Further Implementation of Agenda 21*

Most people have no idea what it means when the (global) State is ultimate with no recourse or appeal to the law of God. Life is very, very cheap to the criminal architects of the NWO.

The main aim of Agenda 21 is to control the world and "reduce" human population. War is one very efficient vehicle for 'population control,' no? A war is already on. Nations appear to have been taken over by internationalists whose goal is world population reduction. Or a main goal at any rate. While the UN speaks vaguely it in terms of population control, insiders say the actual objectives are far more pernicious. It is all documented, all in the open, in various places, and it appears to be coming to a head. The 'world' rulers it seems think only they have a right to rule, indeed to live...no one else will have rights except in terms of Orwellian transvaluations of language , if IT is allowed to stand. It is not population but thee consfiscations of lands by the eiltes and the gross energy-consuming hyperreal civilizations that these have built for themselves, buttressed by the military-industrial complex making war all over the earth at the expense of the poor.

Much is uncertain, but enough is known (the goals, the Agenda) not to trust *anything* that comes out of the controlled establishment media. Wake up your neighbors. Get away from TV. It is all propaganda designed to numb you and fatten you for the possible slaughter or slavery. Begin doing penance for your sins as we all must. Prepare to help our neighbors.

Those who do not believe the elites can be so wicked have not paid attention to billions who died in 20th century wars which were waged to launch the globalist League of nations and, when it aborted, the UN one world Plan with the US, Britain and Israel at the lead, all controlled by *international finance*. It is the new Anglo-American-Israeli colonialism dominating through the ruse of "world" institutions which they set up for this very purpose. Some suggest it is why Gorbachev and Reagan in concert allowed the Berlin wall to come down so suddenly, 200 years after the French Revolution in 1989. It was all theater and preparation, they say.

There are still large numbers of people amongst the general public, in academia, and especially those who work for the corporate media, who are still in denial about the on-the-record stated agenda for global population reduction, as well as the consequences of this program that we already see unfolding

We have compiled a compendium of evidence to prove that the elite have been obsessed with eugenics and its modern day incarnation, population control, for well over 100 years and that goal of global population reduction is still in full force to this day.

**The World's Elite Are Discussing Population Reduction**

As was reported only last month by the London Times, a "secret billionaire club" meeting in early May which took place in New York and was attended by David Rockefeller, Ted Turner, Bill Gates and others was focused around "how their wealth could be used to slow the growth of the world's population".

We questioned establishment media spin which portrayed the attendees as kind-hearted and concerned philanthropists by pointing out that Ted Turner has publicly advocated shocking population reduction programs that would cull the human population by a staggering 95%. He has also called for a Communist-style one child policy to be mandated by governments in the west. In China, the one child policy is enforced by means of taxes on each subsequent child, allied to an intimidation program which includes secret police and "family planning" authorities kidnapping pregnant women from their homes and performing forced abortions.

Of course, Turner completely fails to follow his own rules on how everyone else should live their lives, having five children and owning no less than 2 million acres of land.

In the third world, Turner has contributed literally billions to population reduction, namely through United Nations programs, leading the way for the likes of Bill & Melinda Gates and Warren Buffet (Gates' father has long been a leading board member of Planned Parenthood and a top eugenicist).

The notion that these elitists merely want to slow population growth in order to improve health is a complete misnomer. Slowing the growth of the world's population while also improving its health are two irreconcilable concepts to the elite. Stabilizing world population is a natural byproduct of higher living standards, as has been proven by the stabilization of the white population in the west. Elitists like David Rockefeller have no interest in "slowing the growth of world population" by natural methods, their agenda is firmly rooted in the pseudo-science of eugenics, which is all about "culling" the surplus population via draconian methods.

**David Rockefeller's legacy is not derived from a well-meaning "philanthropic" urge to improve health in third world countries, it is born out of a Malthusian drive to eliminate the poor and those deemed racially inferior, using the justification of social Darwinism.**

As is documented in Alex Jones' seminal film Endgame, Rockefeller's father, John D. Rockefeller, exported eugenics to Germany from its origins in Britain by bankrolling the Kaiser Wilhelm Institute which later would form a central pillar in the Third Reich's ideology of the Nazi super race. After the fall of the Nazis, top German eugenicists were protected by the allies as the victorious parties fought over who would enjoy their "expertise" in the post-war world.

> As Dr. Len Horowitz writes, "In the 1950s, the Rockefellers reorganized the U.S. eugenics movement in their own family offices, with spinoff population-control and abortion groups. The Eugenics Society changed its name to the Society for the Study of Social Biology, its current name."
>
> "The Rockefeller Foundation had long financed the eugenics movement in England, apparently repaying Britain for the fact that British capital and an Englishman-partner had started old John D. Rockefeller out in his Oil Trust. In the 1960s, the Eugenics Society of England adopted what they called Crypto-eugenics, stating in their official reports that they would do eugenics through means and instruments not labeled as eugenics."
>
> "With support from the Rockefellers, the Eugenics Society (England) set up a sub-committee called the International Planned Parenthood Federation, which for 12 years had no other address than the Eugenics Society. This, then, is the private, international apparatus which has set the world up for a global holocaust, under the UN flag."

In the latter half of the 20th century, eugenics merely changed its face to become known as "population control". This was crystallized in National Security Study Memorandum 200, a 1974 geopolitical strategy document prepared by Rockefeller's intimate friend and fellow Bilderberg member Henry Kissinger, which targeted thirteen countries for massive population reduction by means of creating food scarcity, sterilization and war. *Henry Kissinger: In the now declassified 1974 document, National Security Memorandum 200, Kissinger outlines the plan to use food scarcity as a weapon in order to achieve population reduction in lesser-developed countries.*

PERFECT EXAMPLE OF HOLLYWOOD PREDICTIVE PROGRAMMING - REMEMBER JOHN HODLREN'S QUOTE AT TOP OF PAGE

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# Florida First State for EPA Nutrient Limits in Sur Waters

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**WASHINGTON, DC, January 18, 2010 (ENS) - The U.S. E is planning to impose limits on phosphorus and nitrogen in Florida waters that will be the first federal standards for nutr pollution in the waters of a state.**

**Phosphorus and nitrogen, known as nutrients because they nourish plants, enter lakes, rivers, streams, springs and canal from fertilization of crops and livestock manure, stormwater runoff and municipal wastewater treatment. Nitrogen also forms from the burning of fossil fuels, like gasoline.**

**The proposed action, developed with state environmental officials, was released for public comment Friday, meeting a court ordered deadline in a case brought by five environmental groups.**

**The standards would set a series of numeric limits on the am of phosphorus and nitrogen that would be allowed in Florida's surface waters.**

**Nutrient pollution can damage drinking water sources and form byproducts in drinking water from disinfection chemicals, so of which have been linked with serious human illnesses like bladder cancer, the EPA said in a statement announcing the proposed action.**

**These nutrients increase harmful algal blooms, which are mad toxic microbes that can cause damage to the human nervous system or even death, the agency said.**

Alligators in the Everglades covered with green algae (Photo by

Nutri problems can lea to degraded lakes reservoirs and estua and to hypo dead zones where aquat life can no longer surviv High amounts of nitrogen and phosphorus in surface water can kill fish, and reduce fish mating grounds and nursery habitats. Many studies have

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