

Fluoride: the Deadly Deception

More than half the world's fluoridated water consumers live in the United States, one of the few countries that still practices this controversial procedure. The effectiveness of fluoride in preventing cavities in children is treated as proven scientific fact by the CDC and FDA, even though decades of research have failed to substantiate this conclusion. Still, two-thirds of Americans are medicated without their consent, in amounts they can't control, with impure waste material from some of the most toxic industries in the country. How is it possible that the US is still conducting what is essentially an unauthorized scientific experiment on its population in defiance of commonly-accepted medical ethics? And why are teams of "experts" still trying to spread the fluoride gospel around the world, when half a century of data proves dental health has been steadily improving without it?

Fluoride's defenders have public opinion, reinforced by decades of propaganda, on their side, but a look at the literature shows no scientific basis for their claims of fluoridation's safety and effectiveness. The amount of scientific evidence that water fluoridation is not only ineffective in its stated purpose but downright dangerous, especially to the young and infirm, is growing all the time. Over 250 communities worldwide have ended fluoridation since 2010. If it was truly essential to children's dental health, these areas would have seen a rebound in incidence of dental caries. Instead, the numbers have continued to decline, paralleling a worldwide decrease in tooth decay rates even in countries that never fluoridated.

NRC STUDY

When American scientists defer to "the academy," they are referring to the National Academy of Sciences, the group of prominent scientists who essentially decide what comprises scientific orthodoxy. The National Research Council, comprised of members of this body, caused a subtle paradigm shift when they published their 467 page report in 2006 reviewing the scientific literature on fluoride's health risks. Commissioned by the EPA after a 1500-strong scientists' union within the agency released a public statement against fluoridation, the NRC Report was intended to defuse a controversy that threatened to bubble over into public awareness, potentially dealing a mortal blow to the fluoride myth - EPA scientists were up in arms against what they saw as the politically expedient, unscientific decision to raise the acceptable fluoride concentration limit to 4mg/L. NRC scientists, who in their last review of the fluoride literature (1993) had had nothing but glowing reviews of the substance in the current high concentration, took no issue with the conclusions of the hundreds of studies they reviewed this time around that detailed fluoride's harmful effects - their recommendation was that future researchers pinpoint at what dose the "risks" outweighed the "benefits" of fluoridating the nation's water supply. The question, then, was no longer whether fluoride was toxic, but whether it was toxic enough to cause health problems in a significant number of consumers at the current maximum concentration level of 4mg/L.¹

Fluoride has never been proven (in a properly constructed double-blind study) to protect against tooth decay, and unfluoridated communities and fluoridated communities alike have seen the prevalence of dental caries decline over the decades, at approximately the same rate, putting the lie to the notion of fluoride as children's dental savior. But with fifty years of their reputation bound up in that notion, the Academy realized they couldn't simply do an about-face on the substance's safety and efficacy. Damning admissions about the toxicity of fluoride in the NRC Report are thus couched in requests for more data, more precise data, or tighter experimental constraints reflecting fluoride consumption at or below the current maximum concentration - all while fluoride's boosters are never asked to produce the science they lack to support their rosy claims.

The NRC ultimately recommended that the EPA reconsider its guidelines for the maximum acceptable fluoride concentration in drinking water, which the agency set at 4mg/L in 1985 over the protests of its own scientists. In 2011, five years after receiving the recommendation it desired from the study it commissioned, the EPA finally announced it would issue new guidelines. It has been over a decade since the NRC published its report. The EPA has still not issued new guidelines for safe levels of fluoride in drinking water. What are they waiting for?

The Department of Health and Human Services finally lowered its recommendation for drinking water to 0.7mg/L in 2015.² But while the EPA continues dragging its feet on coming up with its own safe level for fluoride concentration, it has already let the cat out of the bag, publishing a review of developmental neurotoxins that includes fluoride, front and center, in the list of "chemicals with substantial evidence of developmental neurotoxicity."³ "Substantial evidence" means more than one laboratory reported developmental neurotoxicity. Dozens of laboratories, in fact, have arrived at this conclusion, but until very recently, none of them had published their findings in the US, where questioning fluoride orthodoxy remained a professional death sentence until very recently.⁴

Decades of American popular opinion hold that fluoride is not only safe but so important to the dental health of the nation's children that to withhold it from them would be medical malpractice. But the Academy is starting to break ranks with the government. In a 2014 paper published in the *Lancet*, Harvard University researcher Philippe Grandjean added six industrial chemicals, including fluoride, to a list of developmental neurotoxins especially harmful to the developing brain. In what was perhaps a subtle nod to the Academy's reluctance to challenge fluoridation dogma, he called for the formation of an international clearinghouse to coordinate research into these neurotoxins and their role in the rising prevalence of neurodevelopmental disabilities worldwide.⁵ Grandjean's paper has been cited by more than 100 scientific journal articles, suggesting that it has removed some of the stigma from studying the toxic effects of fluoride in the US. More, he opened the field up to further scrutiny, writing that the vast majority of more than 80,000 commonly used industrial chemicals have never been tested for toxicity in children or even adults.

DENTAL FLUOROSIS

Dental fluorosis continues to rise among fluoridated populations. While the rate of dental caries has declined in fluoridated and nonfluoridated communities alike since before fluoridation began in 1945, fluorosis now afflicts as much as 70% of the teenage population in some areas of the US. A 2010 CDC study revealed that among adolescents aged 12-15, prevalence of dental fluorosis had increased for the years 1999-2004 compared to 1986-1987, from 22.6% to 40.7%.⁶ This is the highest rate since water fluoridation began, a 400% increase from 60 years ago. Wiener et al. concurred in 2018, finding dental fluorosis rates were up 31.6% between the periods 2001-2002 and 2011-2012 in adolescents ages 16 and 17.⁷ With more US communities consuming fluoridated water than ever, the medical establishment should be concerned that fluorosis outcomes in these communities are worsening over the years. Dental fluorosis is more than just an unsightly discoloration. A 2018 Chinese study suggests degree of dental fluorosis can actually be used as an exterior visual measure of fluoride-induced brain damage. The study also confirmed that even low to moderate fluoride exposure - 0.20mg/L-1.40mg/L in the lowest case - correlates to a decrease of 2.67 IQ points per 0.5mg/L increase in drinking water fluoride concentration.⁸

EFFECT ON INTELLIGENCE

Over the last 10 years, dozens of studies have been published from countries as diverse as China, India, Iran, and Mexico confirming the link between water fluoridation and neurological damage, even in areas of relatively low fluoride concentration. A 2017 study of

prenatal fluoride exposure in Mexico showed marked IQ reductions with in utero exposure to fluoride concentrations as low as 0.15-1.38mg/L, and that those IQ reductions persist through ages 6-12, with every increase in prenatal fluoride exposure of 0.5mg/L corresponding to a drop in IQ of about 2.5 points.⁹ A similar study from China revealed significant differences in several developmental markers, including non-biological visual orientation reaction and biological visual and auditory orientation reaction, as well as significant differences in the neonatal behavioral score and the neonatal behavioral neurological assessment score between newborns exposed to fluoride in utero and a control group of newborns.¹⁰ The research not only shows fluoride is eminently capable of crossing both the placenta and blood-brain barrier to accumulate in fetal neural tissue, but suggests even the extreme plasticity of the neonatal brain cannot overcome the damage done through in utero exposure to the neurotoxin.

Recent studies have illuminated numerous and complex pathways of action through which fluoride damages the brain. Exposure to the highly-reactive fluoride ions results in a decreased volume of cerebral cortex nerve cells, hippocampal pyramidal cells, cerebellar Purkinje cells, and nerve blast stem cells. Distressed mitochondria are evident upon examination, as are disordered neurotransmitter levels,¹⁰ malformed synapses and myelin damage.¹¹ A 2018 Chinese study points to endoplasmic reticular stress as the mechanism by which fluoride causes cell death, particularly in the hippocampus.¹² Almost 50 studies have been published since 2010 exploring fluoride's multiple means of action in the hippocampus, ground zero for the substance's detrimental influence on the learning and memory functions.^{13,14} Dec et. al. uncovered several other mechanisms through which fluoride disrupts central nervous system function, including ion transport, neurotransmitter metabolism, oxidative stress, and inflammation ultimately leading to apoptosis and permanent brain damage.¹⁵

In China, where fluoride naturally occurs in some groundwater areas but is not deliberately added to the water, the substance is well established as a neurotoxin. Anna Choi and Philippe Grandjean of Harvard University, in collaboration with China Medical University in Shenyang, conducted a meta-analysis of 27 Chinese studies in 2012 and found a clear link between even low concentrations of fluoride and impaired cognitive development in children. Such a strong correlation is impossible to ignore, and their findings indicate the necessity for further research.¹⁶ In 2014, Choi et.al. performed their own study on a group of children in Sichuan, confirming the suspected link between impaired cognitive function and moderate and severe dental fluorosis stemming from exposure to fluoride in groundwater.¹⁷

It is telling that Choi and Grandjean had to look to China for material for their meta-analysis - no analogous human studies had been conducted in the US, and to date, of the 60 published studies that have explored the relationship between fluoride exposure and intelligence in humans, not one has taken place on American soil. This is ultimately a crisis of scientific integrity. Results indicating the chemical added to the water ostensibly to help children's teeth is actually making them dumber would not look good for fluoride's champions at the EPA and CDC, which touts water fluoridation as one of the top 10 public health achievements of the twentieth century, but researchers must be prepared to confront controversy. American scientists face the unappetizing prospect of begging for funding from corporations (or universities funded by corporations) that may have investments in the phosphate fertilizer or aluminum industries, which depend on water fluoridation for an inexpensive method of disposing of their toxic manufacturing byproducts. China actually sells the byproducts of its own phosphate fertilizer manufacture to the US, where the waste is dumped into our water along with trace elements of arsenic, lead, and other contaminants.

A 2015 study comparing the presence of fluoride in public water systems with the prevalence of ADHD diagnoses in the surrounding communities found a definite correlation, which persisted even after controlling for socioeconomic status. Earlier rat studies showed that fluoride injections could reliably produce ADHD-like symptoms in the animals, though confirming the link in humans requires further research. Current ADHD literature lists many of the other neurotoxicants described in Grandjean's 2014 paper, including substances like lead and arsenic which act synergistically with fluoride, and it is not unrealistic to think that fluoride too may play a role in the development of this condition.¹⁸

A 2011 rat study appears to implicate fluoride's thyroid-inhibiting effects in its retardation of learning and memory functions. Basha et.al. found a significant decrease in T4 and T3 thyroid hormone levels, as well as acetylcholinesterase activity, in rats exposed to fluoride; multiple areas of degenerating neurons were observed in their brains. The fluoride-dosed rats proceeded to perform poorly on acquisition and retention in T-maze experiments, effects which not only persisted but deepened in the next two generations of rats. The researchers posit that the decrease in thyroid hormones set the rats' oxidant/antioxidant system off balance, reducing their learning and memory abilities. Most significantly, the study shows that fluoride's effects on learning and memory are cumulative - a disturbing prospect given how much damage water fluoridation has already wrought in just 60 years, and even more so in conjunction with the prenatal exposure studies.¹⁹ A 2017 Chinese study took the conclusions further, concluding that the reduced thyroid hormone secretion resulting from exposure to high levels of fluoride caused abnormal mitochondrial dynamics in peripheral lymphocytes and that this mitochondrial behavior could be used as a biomarker for individuals with fluoride-damaged hippocampal functions.²⁰

ENDOCRINE FUNCTION

The 2006 NRC report unequivocally states that fluoride is an endocrine-disrupting chemical (EDC). Even the World Health Organization, in its 2012 report on the State of the Science of Endocrine Disrupting Chemicals, mentions sodium fluoride (the compound originally used to fluoridate drinking water in the US, which is now used in fewer than 10% of communities, having been replaced with riskier and more volatile SiFs) as an EDC that, like the hormones it mimics, is active at a low dose.²¹ A 2012 review of EDCs by Vandenberg et.al mentions fluoride as an EDC that inhibits insulin secretion, parathyroid and thyroid hormones at very low doses, much lower than the EPA's acceptable threshold of 4mg/L, and which ultimately affects bone mass and strength at those doses. Such a low active dose indicates that there is no truly safe dose for consumption that would avoid these endocrine-disrupting effects.²²

A meta-analysis conducted in 2018 found a strong correlation between water fluoridation and hypothyroidism²³ and a 2018 study measuring the impact of fluoride exposure on levels of T3, T4 and TSH thyroid hormones demonstrated a significant effect in concentrations as low as 0.3mg/L, which would be expected given the substance's low-dose activity as per the EDC designation.²⁴ A 2015 UK study found that fluoridated communities were nearly twice as likely to report high prevalence of hypothyroidism as unfluoridated communities, even though the UK only fluoridates at a level of 1mg/L - one-quarter the accepted upper limit of fluoride concentration in the US.²⁵ As the obesity rate continues to climb in western countries, it is worth studying to what extent fluoride-induced hypothyroidism may play a role.

A 2016 study found a correlation between water fluoridation and diabetes prevalence which persisted after controlling for socioeconomic status, population density, age-adjusted physical activity and shifts in per-capita tap water consumption: for every 1mg increase in fluoride concentration, a .23 per 1000 person increase in age-adjusted diabetes incidence was present.²⁶ A causal hypothesis is absent from that study, but given fluoride's established inhibition of insulin secretion and promotion of insulin resistance, as well as its induction of oxidative stress in all types of soft tissue, several mechanisms of action could be responsible for the relationship.

REPRODUCTION

Previous research on fluoride's effect on the reproductive system had focused largely on its impact on males; recent research has illuminated its effects on females. Liang et.al found extensive toxic effects in a pair of studies of fluoride's impact on the female reproductive system. Exposing pig oocytes to sodium fluoride "inhibited cumulus cell expansion and impaired polar body extrusion... blocked meiotic resumption, disturbed spindle dynamics, disrupted chromosome separation, and increased aneuploidy...disturbed mitochondrial function, triggered DNA damage response, and induced early apoptosis...induced oxidative stress, decreased GSH level, and increased cathepsin B activity in and impaired the further development potential of porcine oocytes."²⁷ Liang et al. also studied fluoride's impact on mouse oocytes, which was similarly destructive.²⁸ A 2013 study showed marked negative effects on rat pregnancies - lowered concentrations of reproductive hormones, inhibited follicle maturation (and lower number of follicles), and fewer successful pregnancies overall. Their results indicated structural damage to the ovaries and uterus and the researchers concluded that "Sodium fluoride may thus significantly reduce the fertility of female rats. Sodium fluoride decreased the rate of successful pregnancy."²⁹ Such results cry out for human studies as fertility rates in the US decline, though western Europe, which does not fluoridate, is in the throes of a similar reproductive crisis. An investigation into the high rates of fetal deaths during and after the Flint water crisis supposedly exonerated lead toxicity, but none of the researchers were looking into fluoride, and that substance's effects on meiotic division could easily have led to the growth and subsequent miscarriage of nonviable embryos.³⁰ Zhang et.al were able to shed more light on the mechanism by which fluoride damages male fertility, as well. In a 2013 rat study, they discovered that fluoride impairs spermatogenesis by inducing testicular inflammation, injuring spermatogonia and deforming spermatocytes themselves. Oxidative stress, inflammation, and endoplasmic reticular disruption were implicated as the mechanisms through which fluoride acted on the reproductive system.³¹

CYTOTOXICITY

Outside of specific bodily systems, fluoride is fundamentally toxic to human cells. Ribeiro et al. discovered in 2017 that fluoride can induce apoptosis - programmed cell death - via multiple pathways with chronic exposure, affecting several different mammalian cell types including oral, brain, and blood cells.³² A 2018 study found fluoride produced apoptosis in cardiomyocytes by promoting inflammation and oxidative stress, disrupting calcium metabolism, and dissolving the extracellular matrix, adding the cardiovascular system to the long list of those organ systems affected negatively by water fluoridation.³³ Chouhan and Flora concurred in their findings that fluoride exercises its toxicity by increasing oxidative stress.³⁴ Agalakova discovered less than 24 hours of fluoride exposure caused the death of rat red blood cells in vitro via a buildup of calcium ions.³⁵

FLUORIDE AND ALUMINUM

Strunicka et.al found that fluoride in combination with aluminum can increase excitotoxicity and inflammation, particularly in the developing brain. Understanding that immunoexcitotoxicity plays a central role in risk factors associated with autism spectrum disorders, they discovered that fluoride and aluminum (when combined as aluminofluoride complexes) act synergistically to amplify immunoexcitotoxicity, also altering cell signaling, neurodevelopment, and central nervous system functions to a much greater degree and in much smaller quantities than either substance can on its own. While aluminum has long been implicated as a possible culprit in the development of ASD, the addition of fluoride to the equation adds another piece to the ASD puzzle.³⁶ Aluminofluoride complexes can wreak potentially unlimited havoc on brain activity by activating G protein-coupled receptors; G proteins regulate the release of common neurotransmitters and central nervous system peptides, while aluminofluorides can bind to and disrupt the ADP molecules used for energy by the neurons, exercising an outside influence on the brain compared to either fluoride or aluminum alone. Aluminofluoride complexes are also implicated in Alzheimer's disease and almost certainly play a role in other neurodegenerative diseases whose causative mechanisms are not yet understood, poised as they are to not only impersonate chemical "messages" but to actually block brain cells from functioning on the most basic level by depriving them of energy. Because aluminum is frequently added to fluoridated water, the danger posed by these complexes should not be underestimated.

FLUORIDE AND LEAD

Most fluoride (90%) added to drinking water in the US is in the form of sodium silicofluoride or fluorosilicic acid (FSA), collectively known as silicofluorides (SiFs). These compounds have never been tested or approved by the FDA as safe for human consumption, and studies have shown that SiFs when present in conjunction with lead can double or even triple the rate of lead uptake into children's bloodstreams.³⁷ Adding FSA to drinking water lowers its pH, making it more corrosive, but even when a pH-neutralizing agent is added to the water, FSA's "unique affinity for lead" leaches the metal from pipes or fixtures containing even small amounts of lead. Combine FSA and lead pipes with chlorine and chloramine, a disinfectant commonly used to treat drinking water, and the rate of lead uptake into the bloodstream spikes even higher.³⁸

High levels of lead exposure in children are linked to violent behavior, and since SiFs exhibit a strong synergistic effect when combined with lead, the combination of the two neurotoxins can only intensify such behavioral issues. Environmental lead, a dopamine depressant, is linked to lack of impulse control and learning deficits; SiFs too are associated with impaired learning and memory, measurable by a marked drop in IQ, and impaired metabolism of neurotransmitters including dopamine. The combination has been found to target glutamate metabolism in the hippocampus, an area of the brain responsible for learning and memory, more aggressively than either substance alone.³⁹

Unlike sodium fluoride, the compound initially used to fluoridate US water supplies, SiFs exhibit a marked interference with cholinergic function, promoting oxidative stress and free radical activity. The inhibitory effect on cholinesterase documented by Gao and others persists outside of the central nervous system as well, interfering in the functioning of muscle and liver tissue as well as red blood cells.⁴⁰

Lead and FSA potentiate each others' effects, worsening both dental fluorosis and neurological damage. Several studies have demonstrated a correlation between the severity of dental fluorosis and the loss of IQ points, suggesting that the unsightly dental condition can be used as a relatively accurate visual representation of the extent of fluoride-induced brain damage.^{41,42} In 2005, Dartmouth College Research Professor Roger Masters called for discontinuing the use of SiFs in municipal water supplies due to their link to violent behavior and the near-inevitability of their acting synergistically with lead given the aging state of US water supply infrastructure. Writing in *Fluoride* magazine, Masters explained, "Given the costs of incarcerating violent criminals, these side-effects justify a moratorium on using silicofluorides for water treatment until they are shown to be safe." Using 1991-era back-of-the-napkin calculations (the cost of incarcerating a criminal for a year has at least doubled in the intervening decades to the point where it now exceeds college tuition in many states) he estimated that a community that is able to reduce the number of its violent crimes by just 50 in a year will save \$1.25 million. He analyzed the violent crime rates in lead-polluted Oregon counties with and without SiF-treated water and found rates of violent crime to be 56% higher in the fluoridated communities, even when controlling for other influential variables such as unemployment rate and socioeconomic status.⁴³ Masters cautioned against extrapolating his conclusions to fluoridation in general, as some of the most egregious effects of SiFs do not occur with treatment by sodium fluoride, but other studies of fluoridation's relationship to crime cast a broader net (for example, Prozac - Eli Lilly's brand name for the fluorinated pharmaceutical fluoxetine - is implicated in a majority of school shootings).⁴⁴ Given the well-documented link between the removal of lead from gasoline and the decline in violent crime nationwide, it is not difficult to imagine that a removal of SiFs from drinking water

could have a similarly dramatic effect.

Masters' concerns that SIFs might be "the worst environmental poison since unleaded gasoline" have been substantiated by the last two decades of research and should have been settled for the scientific community by the Flint water crisis.

FLINT: A CASE STUDY

The recent lead contamination crisis in Flint, MI should have dragged fluoride back into the headlines; that it did not is a testament to the control that pro-fluoride interests exercise over the American media and scientific establishment. We know fluoride is more toxic than lead. We know the two neurotoxins potentiate each other's effects, particularly when combined with chlorine and chloramine, chemicals frequently added to municipal water supplies for disinfection purposes. Flint was a perfect storm of mismanagement and decaying infrastructure, yes, but fluoride was the catalyst that unleashed the tide of neurotoxicity into the community's water. Yet of the 50 articles published in scientific journals about the Flint crisis, analyzing and dissecting the effects of lead contamination from every conceivable angle, none mention the role of fluoride.

Flint, MI was over \$19 million in debt in 2012, when former mayor Darnell Earley was appointed Emergency Manager to oversee the city's ailing finances. In April 2014, in an effort to save \$5 million over two years, Earley switched the city's water supplier from Lake Huron to the Flint River, which had previously served as a backup water source. Water from the new source, untreated with corrosion inhibitors (which would have cost \$140 per day) to counterbalance the acidic FSA, tore through the municipality's decaying pipes, leaching lead into the water supply in such levels that residents immediately began complaining about weird smells and tastes, discoloration, and rust. Aesthetic complaints were soon followed by physical symptoms: rashes, hair loss, vision loss. The Michigan Department of Environmental Quality insisted the water was fit to drink, issuing and then retracting an advisory notice that residents boil it anyway after fecal coliform bacteria were discovered in two samples. Boiling water increases lead and fluoride concentration, since it merely concentrates the metals; meanwhile, the city added more chlorine to the water to address the bacterial issue, exacerbating the synergistic leaching effect of the FSA and lead pipes.

The city sat on an incriminating report written by Virginia Tech professor Marc Edwards for five months even as EPA scientists found lead levels seven times higher than the acceptable limit in residents' homes. The Virginia Tech study team reported in September 2015 that a full 40% of Flint homes had elevated lead levels, while local pediatrician Mona Hanna-Attisha found the number of children with elevated blood lead levels had doubled since Flint switched its water source, rising from 2.4% to 4.9% and in some areas from 4% to 10.6%.⁴⁵ The emergency manager nevertheless vetoed a City Council vote to return to purchasing Detroit water, concerned about future costs, and the state tried to soothe residents' worries while privately supplying its own employees with bottled water.

Michigan governor Rick Snyder authorized a switch back to Flint's previous water supplier in October 2015, but the damage to the pipes was severe, and Flint mayor Karen Weaver declared a state of emergency two months later. Residents filed a class-action lawsuit against 14 government officials, including Snyder. By the time President Barack Obama declared a federal state of emergency in January 2016, more than 10,000 children had been exposed to the neurotoxin, and an epidemic of Legionnaire's Disease that sickened 87 and killed 12 was also linked to the contamination.⁴⁶ In a cruel irony, it emerged that replacing the heavily corroded pipes would cost the state \$1.5 billion, much more than it would have spent buying Lake Huron water from Detroit during the intervening two years. Flint's water only began testing below the federal limit for lead in January 2017.

Replacing the pipes will be the cheap part. Hundreds of victims filed dozens of lawsuits against the city, state, school districts, corporations involved, and other relevant parties. Over a dozen government officials were hit with criminal charges, including manslaughter, obstruction of justice, and conspiracy. The EPA and Governor Snyder blamed the Michigan Department of Environmental Quality, which pooh-poohed the first reports from Attisha and Edwards as attention-seeking alarmism. In April 2018, the EPA honored Edwards with a \$1.9 million grant for further research into lead contamination in the nation's drinking water supplies. One wonders if part of the payment was a reward for keeping his mouth shut about fluoride's role in the catastrophe. As an expert in lead contamination, he must understand the role fluoridated water plays in disasters such as Flint, and would be in a useful position to educate vulnerable populations if he chose to do so.

Certainly the EPA knows that if the scientific truth about fluoride should ever break through the propaganda wall, its credibility would take a major hit, and the financial repercussions will make Flint's multi-billion dollar price tag look cheap. The sheer volume of lawsuits that would flood the American courts if scientific fact overcomes accepted wisdom will be unlike anything our judicial system has seen.

Flint is also a textbook case of water fluoridation's disproportionate effects on the poor. Not only are they unable to afford alternatives to tap water, but they are less likely to consume a nutritious diet and more likely to suffer from health conditions that make them more susceptible to the effects of fluoride - diseases like diabetes and kidney failure that impair the body's ability to process fluoride and contain its toxic effects. Such susceptibility sets up a vicious cycle - the poor are also less likely to be able to afford medical treatment, meaning they get sicker and stay that way, meaning the fluoride affects them more extensively. Thousands of children were exposed to contaminated water in Flint, and it may never be known how many suffered brain damage as a result, but the continued presence of fluoridated water in Flint means they are not out of harm's way. Forty percent of Flint residents are poor, and the majority are Black - another group that is unusually susceptible to fluoride's effects, for reasons including higher rates of lactose intolerance (calcium, commonly found in milk products, is needed to mineralize fluoride in bones to prevent osteomalacia).

Flint is just the tip of the iceberg with regard to catastrophic poisoning in the US. A December 2016 Reuters report found over 3000 areas with more than double the lead poisoning rates of Flint's.⁴⁷ Until the role of fluoride in promoting the leaching of lead from the old pipes that comprise so much of the US's decaying infrastructure is publicly addressed, the mechanism by which lead poisoning occurs cannot be fully understood. The EPA and state authorities face a catch-22 - if they admit and subsequently promote awareness of the harmful effects of fluoride, they are admitting culpability in injuring millions of American citizens over the past half century. Fluoride - with a potential "class action" of hundreds of millions of people - could bankrupt the EPA, the CDC, the ADA, Alcoa, or whoever else ends up getting sued. Alternatively, they could soak taxpayers for the payout, sparking a nationwide austerity spiral that will make Flint look like Dubai. But if the agencies continue to play dumb regarding the relationship between fluoride and lead poisoning, they face a future of putting out Flint-sized fires, forever playing catch-up to the latest catastrophe.

As more Americans become aware of the dangers of fluoridated water, they may consult the scientific literature for natural remedies, and significant progress has been made on this front over the last decade. A 2015 rat study found that melatonin bolstered antioxidant activity in the brain, suppressing fluoride-induced inflammation and resulting cognitive impairment to such a degree that the cognitive deficits normally present in fluoride-exposed test subjects was absent.⁴⁸ Resveratrol has also been demonstrated to counteract fluoride-induced oxidative stress. A 2014 study demonstrated significant neuroprotective and hepatoprotective effects in fluoride-exposed rat populations.⁴⁹ Curcumin, the powerful antioxidant found in turmeric, has been shown to ameliorate some of the

neurodegenerative effects of fluoride⁵⁰ and reverse some fluoride-induced damage to red blood cells in rats.⁵¹ Preemptive administration of curcumin was also successful in protecting rat kidneys ahead of fluoride exposures⁵². Curcumin also demonstrated protective effects against fluoride-induced changes in rat thyroid glands.⁵³ Tiwari and Rao found curcumin protects against fluoride genotoxicity in human peripheral blood lymphocytes.⁵⁴ Combining resveratrol and curcumin reduced neurodegeneration in multiple brain areas and reversed some of the memory and learning deficits caused by fluoride exposure in mice.⁵⁵ Multiple studies have demonstrated the effectiveness of quercetin in countering fluoride-induced oxidative stress in neural tissue⁵⁶ and hepatic tissues⁵⁷. Even the humble blackberry has been shown to have a protective effect against fluoride-induced oxidative stress.⁵⁸

Much of the recent science regarding the health effects of fluoride exposure has merely verified and strengthened conclusions drawn by previous researchers, but some new discoveries have been made, and the trend away from fluoridation - Ireland and Australia in particular have seen large-scale moves to end the procedure in recent years - suggests that scientific fact is slowly winning out over "accepted wisdom." In 2014, the CDC posted its first decline in the percentage of American communities fluoridating their water - a small but meaningful drop from 67.1% to 66.3% since 2012.⁵⁹ Given the outsize influence of large corporations in funding scientific studies, US researchers may feel their hands are tied in contradicting the prevailing wisdom about fluoride, but with every study published (and there have been over 1400 indexed on PubMed in the last 10 years), those barriers erode, particularly as more robust and timely translation pipelines emerge for studies coming out of countries where scientists aren't burdened with these conflicts of interest. Water fluoridation is an outgrowth of a medically naive and scientifically irresponsible era that gave us DDT, styrofoam packaging, doctors starring in cigarette ads, and "our friend the atom." These sociocultural touchstones have largely faded, yet fluoridation remains, an anachronism in a world that has embraced scientific progress over dogma. The US must join the civilized world and reject this unscientific practice. Our health hangs in the balance.

HISTORY OF FLUORIDE

"We would not purposely add arsenic to the water supply. And we would not purposely add lead. But we do add fluoride. The fact is that fluoride is more toxic than lead and just slightly less toxic than arsenic."¹

These words of Dr. John Yiamouyiannis may come as a shock to you because, if you're like most Americans, you have positive associations with fluoride. You may envision tooth protection, strong bones, and a government that cares about your dental needs. What you may not know is that the fluoride added to drinking water and toothpaste is a crude industrial waste product of the aluminum and fertilizer industries, and a substance toxic enough to be used as rat poison. How is it that Americans have learned to love an environmental hazard? This phenomenon can be attributed to a carefully planned marketing program launched even before Grand Rapids, Michigan, became the first community to officially fluoridate its drinking water in 1945.² As a result of this ongoing campaign, nearly two-thirds of the nation has enthusiastically followed Grand Rapids' example. But this push for fluoridation has less to do with a concern for America's health than with industry's penchant to expand at the expense of our nation's well-being.

What is Fluoride? Many people associate fluoride with its periodic table namesake, fluorine. While fluorine is an element (a gas that is frequently listed as a trace mineral and human nutrient), fluoride is very different. Fluoride is a compound of fluorine, and while fluorine is one of earth's natural elements, fluoride is a chemical byproduct ("chemical byproduct" = toxic waste) of aluminum, phosphate, cement, steel, and nuclear weapons manufacturing.³ Its toxicity was recognized at the beginning of the Industrial Revolution, when, in the 1850s iron and copper factories discharged it into the air and poisoned plants, animals, and people.⁴

In the early years of the 20th Century, a young dentist named Frederick McKay settled in Colorado Springs, Colorado. There, he discovered that as many as 90% of lifetime residents of the town had grotesque brown stains on their teeth, and that the tooth enamel had an irregular surface texture described as "mottled". Locals referred to the familiar condition as Colorado Brown Stain, but no one had a clue as to its cause. Over the next two decades Dr. McKay, later with the help of dental researcher G. V. Black, proved that the cause was something contaminating the water supply. They also speculated that the affected teeth might be somewhat more resistant to decay.⁵ By the 1920's, rapid industrial growth had exacerbated the problems of industrial pollution, and fluoride was one of the biggest problems. Medical writer Joel Griffiths explains that "it was abundantly clear to both industry and government that spectacular U.S. industrial expansion -- and the economic and military power and vast profits it promised -- would necessitate releasing millions of tons of waste fluoride into the environment."⁶ Their biggest fear was that "if serious injury to people were established, lawsuits alone could prove devastating to companies, while public outcry could force industry-wide government regulations, billions in pollution-control costs, and even mandatory changes in high-fluoride raw materials and profitable technologies."⁷

In 1931, by means of photo-spectrographic analysis of McKay and Black's water samples conducted at the laboratories at the Aluminum Company of America (ALCOA), it was confirmed that the cause of the mottled teeth was fluoride in the water supply. ALCOA took a proprietary interest in this issue, since fluoride is a major waste product of aluminum production. The company wanted to know how much fluoride exposure people could tolerate without getting mottled, discolored teeth. Or, more specifically, how much fluoride could ALCOA release into the nation's earth, water, and air without the public realizing that the company was polluting the environment with a powerful toxin?⁸

That question was to be addressed later that same year, when H. Trendley Dean was sent to study water sources in 345 Texas communities. Dean, a former dental surgeon for the US Public Health Service, was then head of the Dental Hygiene Unit of the National Institute of Health (Dean's overseer and mentor at the USPHS had been Treasury Secretary Andrew W. Mellon, a founder and major stockholder of ALCOA). Based on his own research, Dean claimed that "fluoride levels of up to 1.0 ppm in drinking water did not cause mottled enamel; if the fluoride exceeded this level, however, fluorosis would occur."⁹

Dean, while establishing the threshold for fluoridation, also explored the idea that fluorosis victims' mottled, discolored teeth were especially decay-resistant. Dean suspected that 1ppm of fluoride added to the water supply would prevent tooth decay, while avoiding damage to bones and teeth.¹⁰ He recommended further studies to determine whether his hypothesis was true.

ALCOA's Pittsburgh industrial research lab, the Mellon Institute, initiated their own research. Biochemist Gerald J. Cox immediately fluoridated some lab rats in a study and concluded that fluoride reduced cavities and that "The case should be regarded as proved." In a historic moment in 1939, the first public proposal that the U.S. should fluoridate its water supplies was made not by a doctor, or dentist, but by Cox, an industry scientist working for a company threatened by fluoride damage claims and burdened by the odious expense of disposing of tons of toxic industrial waste. Cox began touring the country, campaigning for fluoridation.¹¹

Dean, meanwhile, continued his research and became the authority on public water fluoridation. He became the first dental scientist at the National Institute of Health, advancing to director of the dental research section in 1945. After World War II, he directed epidemiological studies for the Army in Germany. When Congress established the National Institute of Dental Research (NIDR) in 1948, Dean was appointed its director, a position he held until retiring in 1953.¹² In his post at the NIDR, he oversaw the first clinical trial of fluoridation in an American city: Grand Rapids, Michigan.¹³

With Dean's impressive credentials, it is easy to assume—and many do—that his findings were scientifically sound. Unfortunately, Dean's "science", when placed under further scrutiny, is shaky, not solid; biased, not impartial; and above all, hardly a standard sound enough to launch mass fluoridation. An independent study of his results revealed that he had engaged in "selective use of data," employing figures from 21 cities that confirmed his findings, and ignoring those from 272 other localities that didn't.¹⁴ In a 1955 court case challenging fluoridation, Dean admitted under oath that his published conclusions were wrong.¹⁵ In hearings conducted by the AMA in 1957, he was forced to admit that dental fluorosis, the first sign of fluoride overdose, could be caused by water fluoridated at 1.0 ppm.¹⁶ Shockingly,

these admissions were not widely publicized, and they were never acknowledged by the USPHS, the American Dental Association, or the other governmental bodies responsible for foisting fluoride on the public. Consequently, this dangerous industrial waste carcinogenic is still dumped in our water today.

At first, industry could dispose of fluoride legally only in small amounts by selling it to insecticide and rat poison manufacturers.¹⁷ But Dean's "discovery" paved the way for a commercial outlet for the toxin. Griffiths writes that this was not a scientific breakthrough, but rather part of a "public disinformation campaign" by the aluminum industry "to convince the public that fluoride was safe and good." Industry's need prompted Alcoa-funded scientist Gerald J. Cox to announce that "The present trend toward complete removal of fluoride from water may need some reversal."¹⁸ Griffiths writes:

"The big news in Cox's announcement was that this 'apparently worthless by-product' had not only been proved safe (in low doses), but actually beneficial; it might reduce cavities in children. A proposal was in the air to add fluoride to the entire nation's drinking water. While the dose to each individual would be low, 'fluoridation' on a national scale would require the annual addition of hundreds of thousands of tons of fluoride to the country's drinking water.

"Government and industry - especially Alcoa - strongly supported intentional water fluoridation... [It] made possible a master public relations stroke - one that could keep scientists and the public off fluoride's case for years to come. If the leaders of dentistry, medicine, and public health could be persuaded to endorse fluoride in the public's drinking water, proclaiming to the nation that there was a 'wide margin of safety,' how were they going to turn around later and say industry's fluoride pollution was dangerous?

"As for the public, if fluoride could be introduced as a health enhancing substance that should be added to the environment for the children's sake, those opposing it would look like quacks and lunatics...."¹⁹

Once the plan was put into action, industry was buoyant. They had finally found the channel for fluoride that they were looking for, and they were even cheered on by dentists, government agencies, and the public. Chemical Week, a publication for the chemical industry, described the tenor of the times when they exclaimed that: "All over the country, slide rules are getting warm as waterworks engineers figure the cost of adding fluoride to their water supplies." The article further explained that the general public quickly adhered to the new trend urged upon them by the U.S. Public Health Service, the American Dental Association, the State Dental Health Directors, various state and local health bodies, and vocal women's clubs from coast to coast. They further wrote that "[fluoridation] adds up to a nice piece of business on all sides and many firms are cheering the PHS and similar groups as they plump for increasing adoption of fluoridation."¹⁹

Such overwhelming acceptance allowed government and industry to proceed hastily, albeit irresponsibly. The Grand Rapids experiment was supposed to take 15 years, during which time health benefits and hazards were to be studied. In 1946, however, just one year into the experiment, six more U.S. cities adopted the process. By 1947, 87 more communities were treated; popular demand was the official reason for this unscientific haste.

The general public and its leaders did support the cause, but only after a massive government public relations campaign spearheaded by Edward L. Bernays, a nephew of Sigmund Freud. Bernays, a public relations pioneer who has been called "the original spin doctor,"²⁰ was a masterful PR strategist. As a result of his influence, Griffiths writes, "Almost overnight...the popular image of fluoride -- which at the time was being widely sold as rat and bug poison -- became that of a beneficial provider of gleaming smiles, absolutely safe, and good for children, bestowed by a benevolent paternal government. Its opponents were permanently engraved on the public mind as crackpots..."²¹ Griffiths explains that while opposition to fluoridation is usually associated with right-wingers, this picture is not totally accurate. He provides an interesting historical perspective on the anti-fluoridation stance:

"Fluoridation attracted opponents from every point on the continuum of politics and sanity. The prospect of the government mass-medicating the water supplies with a well-known rat poison to prevent a nonlethal disease flipped the switches of delusionals across the country - as well as generating concern among responsible scientists, doctors, and citizens.

"Moreover, by a fortuitous twist of circumstances, fluoride's natural opponents on the left were alienated from the rest of the opposition.

Oscar Ewing, a Federal Security Agency administrator, was a Truman "fair dealer" who pushed many progressive programs such as nationalized medicine. Fluoridation was lumped with his proposals. Inevitably, it was attacked by conservatives as a manifestation of "creeping socialism," while the left rallied to its support. Later, during the McCarthy era, the left was further alienated from the opposition when extreme right-wing groups, including the John Birch Society and the Ku Klux Klan, raved that fluoridation was a plot by the Soviet Union and/or communists in the government to poison America's brain cells.

"It was a simple task for promoters, under the guidance of the 'original spin doctor,' to paint all opponents as deranged - and they played this angle to the hilt....

"Actually, many of the strongest opponents originally started out as proponents, but changed their minds after a close look at the evidence. And many opponents came to view fluoridation not as a communist plot, but simply as a capitalist-style con job of epic proportions. Some could be termed early environmentalists, such as the physicians George L. Waldbott and Frederick B. Exner, who first documented government-industry complicity in hiding the hazards of fluoride pollution from the public. Waldbott and Exner risked their careers in a clash with fluoride defenders, only to see their cause buried in toothpaste ads."²²

By 1950, fluoridation's image was a sterling one, and there was not much science could do at this point. The Public Health Service was fluoridation's main source of funding as well as its promoter, and therefore caught in a fundamental conflict of interest.²³ If fluoridation was found to be unsafe and ineffective, and laws were repealed, the organization feared a loss of face, since scientists, politicians, dental groups, and physicians unanimously supported it.²⁴ For this reason, studies concerning its effects were not undertaken. The Oakland Tribune noted this when it stated that "public health officials have often suppressed scientific doubts" about fluoridation.²⁵ Waldbott sums up the situation when he states that from the beginning, the controversy over fluoridating water supplies was "a political, not a scientific health issue."²⁶

The clever marketing of fluoride continued. In a 1983 letter from the Environmental Protection Agency, then Deputy Assistant Administrator for Water, Rebecca Hammer, wrote about the EPA's stance on fluoridation: "[the EPA] regards [fluoridation] as an ideal environmental solution to a long-standing problem. By recovering by-product fluosilicic acid from fertilizer manufacturing, water and air pollution are minimized and water utilities have a low-cost source of fluoride available to them."²⁷ More recently, a 1992 policy statement from the Department of Health and Human Services says, "A recent comprehensive PHS review of the benefits and potential health risks of fluoride has concluded that the practice of fluoridating community water supplies is safe and effective."²⁸

Today, nearly 435 million people worldwide drink fluoridated water, including about 211 million Americans in 18200 communities.²⁹ Out of the 50 largest cities in the US, 47 have fluoridated water. More people in the US drink fluoridated water than in the rest of the world combined.³⁰

To help celebrate fluoride's widespread use, the media reported on the 50th anniversary of fluoridation in Grand Rapids. Newspaper articles titled "Fluoridation: a shining public health

success"³¹ and "After 50 years, fluoride still works with a smile"³² painted glowing pictures of the practice. Had investigators looked more closely, though, they might have learned that children in Muskegon, Michigan, a nearby un-fluoridated "control" city, had equal drops in dental decay. Had they looked closer, they would have seen the dangerous truth behind the supposed wonder of fluoride.

MYTH VS. REALITY

The big hope for fluoride was its ability to immunize children's developing teeth against cavities. Rates of dental caries were supposed to plummet in areas where water was treated. Yet decades of experience and worldwide research have contradicted this expectation

numerous times. Here are just a few examples:

In British Columbia, only 11% of the population drinks fluoridated water, as opposed to 40-70% in other Canadian regions. Yet British Columbia has the lowest rate of tooth decay in Canada. In addition, the lowest rates of dental caries within the province are found in areas that do not have their water supplies fluoridated.³³

According to a Sierra Club study, people in un-fluoridated developing nations have fewer dental caries than those living in industrialized nations. As a result, they conclude that "fluoride is not essential to dental health."³⁴

In 1986-87, the largest study on fluoridation and tooth decay ever was performed. The subjects were 39,000 school children between 5 and 17 living in 84 areas around the country. A third of the sites were fluoridated, a third were partially fluoridated, and a third were not. Results indicate no statistically significant differences in dental decay between fluoridated and un-fluoridated cities.³⁵ The benefit to fluoridated communities, if there is any, amounts to 0.6 fewer decayed tooth surfaces per child, which is less than one percent of the tooth surfaces in a child's mouth.³⁶

A World Health Organization survey reports a decline of dental decay in western Europe, which is 98% un-fluoridated. They state that western Europe's declining dental decay rates are equal to and sometimes better than those in the U.S.³⁷

A 1992 University of Arizona study yielded surprising results when they found that "the more fluoride a child drinks, the more cavities appear in the teeth."³⁸

Although all Native American reservations are fluoridated, children living there have much higher incidences of dental decay and other oral health problems than do children living in other U.S. communities.³⁹

A 1999 study of water fluoridation in Italy shows that parents' socioeconomic status, area of residence, and children's sweets consumption are more significant predictors of dental caries than fluoride consumption. The authors conclude that universal fluoridation is an inadequate approach and the decision to fluoridate or de-fluoridate water requires careful epidemiological consideration.⁴⁰

A 2001 article in the Journal of the American Dental Association admits that the fluoride that is swallowed and incorporated into teeth is "insufficient to have a measurable effect" on reducing cavities.⁴¹ This is a stunning admission from the ADA, historically one of the principal supporters and defenders of water fluoridation.

A follow-up of a study of the town of Kuopio, Finland six years after fluoridation was discontinued found no increase in dental caries. The authors conclude that fluoridation was unnecessary to begin with.⁴²

A study comparing prevalence and incidence of caries in 2,994 life-long residents of British Columbia, Canada, in grades 5, 6, 11, 12, found that caries incidence was not different between the still-fluoridating and fluoridation-ended communities.⁴³

In 1997, following the cessation of drinking water fluoridation in La Salud, Cuba, caries prevalence remained at a low level for the 6- to 9-year-olds and appeared to decrease for the 10/11-year-olds. In the 12/13-year-olds, there was a significant decrease while the percentage of caries-free children of this age group had increased from 4.8 (1973) and 33.3 (1982) up to 55.2%.⁴⁴

A 1998 study conducted in New Zealand found that "when the timing of various forms of fluoride supplementation is correlated with the decline in caries, the decline continues beyond the time of maximum population coverage with fluoridated water and fluoridated toothpaste." The authors call for a "reassessment of the fluoride effect."⁴⁵

In contrast to the anticipated increase in dental caries following the cessation of water fluoridation in the German cities Chemnitz (formerly Karl-Marx-Stadt) and Plauen, a significant fall in caries prevalence was observed. This trend corresponded to the national caries decline and appeared to be a new population-wide phenomenon.⁴⁶

A 1999 New York State Department of Health study of 3,500 7-14-year-olds shows that children in fluoridated Newburgh, New York, have no less tooth decay but significantly more dental fluorosis than children from Kingston, New York, which has never been fluoridated. Since 1945, children of the two towns have been examined periodically in order to demonstrate that fluoridation reduces tooth decay. "This new research shows the experiment has failed," the report concludes.⁴⁷ A similar comparison revealed that "In most European countries, where [water fluoridation] has never been adopted, a substantial decline [75%] in caries prevalence has been reported in the last decades".⁴⁸

In light of all the evidence, fluoride proponents now make more modest claims. For example, in 1988, the ADA professed that a 40- to 60% cavity reduction could be achieved with the help of fluoride. Now they claim an 18- to 25% reduction. Other promoters mention a 12% decline in tooth decay.

An analysis of the fluorapatite layer formed by fluoride over tooth enamel found the layer to be just six nanometers thick - less than 1/1000th the width of a strand of hair - casting doubt on its supposed ability to strengthen and re-mineralize teeth.⁴⁹

And other former supporters are even beginning to question the need for fluoridation altogether. In 1990, a National Institute for Dental Research report stated that "it is likely that if caries in children remain at low levels or decline further, the necessity of continuing the current variety and extent of fluoride-based prevention programs will be questioned."⁵⁰ This is a startling claim coming from the very same governmental organization that spearheaded the drive for compulsory water fluoridation.

A 1999 review of literature conducted by Dr. Hardy Limeback, a long-time advocate of water fluoridation in Canada, indicates that the topical effect of fluoride is its primary mechanism for the prevention of dental caries. Swallowing fluoridated water is ineffective and unnecessary. Limeback concludes that everyone working in the dental health field must examine more closely the risks and benefits of fluoride in all its delivery forms.⁵¹

According to Dr. Limeback, head of preventive dentistry at the University of Toronto, "Dental decay rates in North America are so low that water fluoridation provides little to no benefit whatsoever these days. In fact, studies show that when you turn the water fluoridation taps off and look for dental decay rates, they don't move whatsoever. There is no increase in dental decay when you stop fluoridating."⁵²

Limeback adds that what you do see is an increase in unsightly dental fluorosis.⁵³

Today fluorosis occurs on two or more teeth in 30% of children in areas where the water is fluoridated, and not all in its mildest form.⁵⁴ In Madhya Pradesh, India, dental fluorosis affects almost half of adolescents ages 12-15,⁵⁵ though the condition is rarely found in the rest of India, which remains 95% unfluoridated.⁵⁶

In a letter published in 1999, dentist and public health official Dr. John Colquhoun, formerly one of New Zealand's most prominent pro-fluoridation advocates and educators, explains how over the course of years he came to recognize that there was no benefit in water fluoridation, and that children's dental health is slightly better in non-fluoridated areas than in fluoridated ones.⁵⁷ As another sign of the growing disillusionment with fluoridation, the National Institutes of Health conducted an intensive review of the data supporting fluoride in tap water, looking at over 560 studies, and expressed in a 2001 news release their disappointment in "the overall quality of the clinical data that it reviewed. According to the panel, far too many studies were small, poorly described, or otherwise methodologically flawed."⁵⁸

Most government agencies, however, continue to ignore the scientific evidence and to market fluoridation by making fictional claims about its benefits and pushing for its expansion. In 1978, the U.S. Department of Health and Human Services noted, "National surveys of oral health dating back several decades document continuing decreases in tooth decay in children, adults and senior citizens. Nevertheless, there are parts of the country and particular populations that remain without protection. For these reasons, the USPHS...has set a national goal for the year 2000 that 75% of persons served by community water systems will have access to optimally fluoridated drinking water; currently this figure is just about 60%. The year 2000 target goal is both desirable and yet challenging, based on past progress and continuing evidence of effectiveness and safety of this public health measure."⁵⁹

The department fell short of its goal - only 65% of public water systems were fluoridated by 2000, and the percentage would not reach 75% until 2014.⁶⁰ But their persistence was based on flawed logic. First, as we've seen, research does not support the effectiveness of fluoridation for preventing tooth disease. The relationship between fluoride and the formation of caries is poorly understood. Second,

purported benefits are supposedly for children, not adults and senior citizens. At about age 13, any advantage fluoridation might offer comes to an end and less than 1% of the fluoridated water supply reaches this population.⁶¹ And third, fluoridation has never been proven safe. On the contrary, numerous studies directly link fluoridation to disease, including skeletal fluorosis, dental fluorosis, thyroid disorders, brain and kidney damage, Alzheimer's disease, lead poisoning, and several rare forms of cancer. This alone should force us to reconsider its use.

SAFETY CONCERNS AND SHODDY SCIENCE

Only a small margin separates supposedly beneficial fluoride levels from amounts that are known to cause adverse effects. Dr. James Patrick, a former antibiotics research scientist at the National Institutes of Health, describes the predicament:

"[There is] a very low margin of safety involved in fluoridating water. A concentration of about 1 ppm is recommended. ...in several countries, severe fluorosis has been documented from water supplies containing only 2 or 3 ppm. In the development of drugs... we generally insist on a therapeutic index (margin of safety) of the order of 100; a therapeutic index of 2 or 3 is totally unacceptable, yet that is what has been proposed for public water supplies."⁶²

Other countries argue that even 1 ppm is not a safe concentration. Canadian studies, for example, imply that children under three should have no fluoride whatsoever. The Journal of the Canadian Dental Association states that "fluoride supplements should not be recommended for children less than 3 years old."⁶³ Since these supplements contain the same amount of fluoride as water does, they are basically saying that children under the age of three shouldn't be drinking fluoridated water at all, under any circumstance. Japan has reduced the amount of fluoride in their drinking water to one-eighth of what is recommended in the U.S. Instead of 1 milligram per liter, they use less than 15 hundredths of a milligram per liter as the upper limit allowed.⁶⁴

The 1 ppm dosage recommendation for water fluoridation has a checkered past, and its present is even more so. As we have seen, the first mention of this "magic" number was made by Dr. Trendley Dean, who jiggled his results to reach the conclusion that "fluoride levels of up to 1.0 ppm in drinking water did not cause mottled enamel; if the fluoride exceeded this level, however, fluorosis would occur."⁶⁵

But the adoption of this dosage for water fluoridation was not Dean's brainchild. It was set in 1953 by Dr. Harold C. Hodge, Ph.D., then chairman of the US National Academy of Sciences committee on toxicology. Unfortunately, Dr. Hodge made a serious miscalculation in his estimate of the safe dosage level for fluoride. His figures err by a factor of 2.25, which means that they understate the toxicity of fluoride considerably. The story of this potentially fatal miscalculation is told in a document from the UK National Pure Water Association:

"It is important when any new drug is marketed that the dose at which it is toxic is determined. There is then a margin allowed for safety (usually a factor of 100) and a maximum dose is published. In 1953 the National Academy of Sciences published their estimate of the quantity of fluoride which produces the condition known as crippling skeletal fluorosis. The calculation was done by a famous toxicologist, Harold C. Hodge, Ph.D., who was chairman of the US National Academy of Sciences (NAS) committee on toxicology.

To arrive at his figures, Hodge cited a classic study of the effects of fluoride among cryolite workers by a European researcher, Kaj Roholm, and published in 1937. Roholm's dosage figures were presented in milligrams of fluoride per kilogram of body weight. In his study, Roholm showed that at levels of 0.2 to 0.35mg/kg some workers developed crippling skeletal fluorosis in a very short time. The first stage of the disease appeared, in general, after 2 1/2 years; stage two was reached by 4 1/2 years; and crippling skeletal fluorosis appeared after 11 years."⁶⁶

Hodge wanted to apply Roholm's figures to a typical range of body weights in order to set a maximum intake level in milligrams per day.

But Hodge was American and used to dealing in pounds rather than kilograms. By using a range of body weights from 100 to 229 pounds, he multiplied the 0.2 mg figure by 100 pounds, giving a figure of 20 mg/day; and 0.35 mg by 229 pounds yielded 80 mg/day. Thus the amounts of fluoride which would cause crippling skeletal fluorosis, he said, were 20mg to 80mg per day. And rather than quote Roholm's eleven year figure for crippling fluorosis, he gave a range of 10 to 20 years. These are the figures that appear in the American Dental Association's pamphlet, *Fluoridation Facts*, and on which many other articles are based, even today.

Unfortunately, Hodge was considered the expert and no-one seems to have checked his figures. This simple but significant error, which gave a false safety margin more than double what it should have been, went unnoticed for many years until anti-fluoride campaigner Darlene Sherrell tried to duplicate Hodge's arithmetic and couldn't make it add up. She discovered that Hodge had made an error when he neglected to convert pounds to kilograms.

Correcting for this error, Sherrell reduced the amount of fluoride needed to cause crippling fluorosis to 10 to 25 milligrams per day, for 10 to 20 years.

Fluorides accumulate throughout our lives, so a higher intake will have the same effect in a shorter time, and smaller doses will have the same effect in a longer time. If we apply Roholm's dosage figures to a lifetime of 55 to 96 years, just 1 mg per day (the amount in one liter of water) for each 55 pounds of body weight could be a crippling dosage. Additionally, individuals with impaired kidney function, immunodeficiencies, heart problems, diabetes, and nutrient deficiencies such as calcium, magnesium and vitamin C are at higher risk of fluoride poisoning than the general population.

In 1989 Sherrell wrote to the NAS and asked on what they based their 20 to 80 mg/day figures. Two years passed before the Academy told her that they had identified Hodge's interpretation of Roholm as the data source.

Four years later the error was finally corrected by the National Research Council's Board on Environmental Studies and Toxicology. Their 1993 publication, *Health Effects of Ingested Fluoride*, changed the figure from 20-80mg/day to 10-20mg/day.⁶⁷

As it happens, Hodge had written a chapter in a book released in 1979 entitled *Continuing Evaluation of the Use of Fluorides*, where he had corrected his previously published figures. But nobody seemed to notice. In 1991, when the US Department of Health and Human Services published their *Review of Fluoride: Benefits and Risks*, they continued to use figures of 20-80 mg/day as the 'crippling daily dose of fluoride'. As late as 1997, the RDA and Dietary Reference Intakes published by the Institute of Medicine were still using these flawed figures.

ONE SIZE DOES NOT FIT ALL

We can get a good idea of how much fluoride is safe by working with Roholm's figures. You will remember that after the figures had been corrected, the amount needed to cause crippling fluorosis in a 100 to 229 lb person was reckoned to be 10 to 20 mg per day for 10 to 20 years. Since fluorides accumulate in a linear fashion, the crippling dosage of 10 mg per day for 10 years is the same as 5 mg per day for 20 years, and so on. If we extrapolate this to a normal lifetime with fluoridated water this is the same as 2.5 to 5 mg per day for 40 to 80 years. But we should note that, for persons with kidney disease, the risk is greater because less fluoride will be eliminated by their malfunctioning kidneys.

It is also important to note that these figures are for crippling fluorosis, the last stage. It will take only four years at 10 mg/day, or sixteen years at 2.5 mg per day, before a 100 pound individual can expect to experience phase 2, musculo-skeletal fluorosis, with chronic joint pain and arthritic symptoms - with or without osteoporosis. That is the amount of fluoride found in just 2 1/2 liters of water. And that's without counting the extra that today is inevitably found in foods, toothpaste, et cetera.

From this it is clear that the only safe limit for fluoride is none.

Even supposing that low concentrations are safe, there is no way to control how much fluoride different people consume, as some take in a lot more than others. For example, laborers, athletes, diabetics, and those living in hot or dry regions can all be expected to drink more water, and therefore more fluoride (in fluoridated areas) than others.⁶⁸ Due to such wide variations in water consumption, it is impossible to scientifically control what dosage of fluoride a person receives via the water supply.⁶⁹

In "50 Reasons to Oppose Fluoridation,"⁷⁰ Paul Connett, Ph.D., Professor of Chemistry at St. Lawrence University (NY) states that the supposedly safe fluoride levels in our water may pose a particular danger for any of the millions of people who suffer from thyroid disorders. He explains:

"Earlier in 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)."⁷¹

With water fluoridation, we are forcing people to drink a thyroid-depressing medication which could serve to promote higher levels of hypothyroidism (underactive thyroid) in the population, and all the subsequent problems related to this disorder, such as depression, fatigue, weight gain, muscle and joint pains, increased cholesterol levels, and heart disease.

A meta-analysis conducted in 2018 confirmed a positive correlation between "excessive" fluoride levels in water and hypothyroidism,⁷² but it bears noting that according to the Department of Health and Human Services, normal fluoride exposure in fluoridated communities is estimated to range from 1.58 to 6.6 mg/day, a range that actually overlaps the dose (2.3 - 4.5 mg/day) shown to decrease the functioning of the human thyroid.⁷³ This is a remarkable fact, and certainly deserves greater attention considering the rampant and increasing problem of hypothyroidism in the United States (in 1999, the second most prescribed drug of the year was Synthroid, a hormone replacement drug, which is used to treat underactive thyroid). More than twenty million people in the U.S. receive treatment for thyroid problems, and many others are thought to go undiagnosed.⁷⁴

Today, 90% of the fluoride added to our drinking water is no longer a natural sodium fluoride compound. Today's fluoride is industrial waste that is complexed with silica or sodium. "Fluoride complexed with silica or sodium is readily ionized to free fluoride ions that are quickly absorbed in the gastrointestinal tract, whereas, when chemically bound to calcium, less of it ionizes and less is absorbed. Calcium inhibits fluoride absorption and is, in fact, the treatment of choice for fluoride ingestion overdoses."⁷⁵

Another concern is that fluoride is not found only in drinking water; it is everywhere. Fluoride is found in foods that are processed, which, in the United States, include nearly all bottled drinks and canned foods.⁷⁶ Researchers writing in *The Journal of Clinical Pediatric Dentistry* have found that fruit juices, in particular, contain significant amounts of fluoride. In a recent study, a variety of popular juices and juice blends were analyzed and it was discovered that 42% of the samples examined had more than 1 ppm of fluoride, with some brands of grape juice containing much higher levels - up to 6.8 ppm! The authors cite the common practice of using fluoride-containing insecticide in growing grapes as a factor in these high levels, and they suggest that the fluoride content of beverages be printed on their labels, as is other nutritional information.⁷⁷ Considering how much juice some children ingest, and the fact that youngsters often insist on particular brands that they consume day after day, labeling seems like a prudent idea.

Clean water activist Jeff Green points out that fluoride is "in Wheaties at 10 ppm, 10 times the amount that you find in water. It's in Post Grape Nuts and Shredded Wheat and Fruit Loops. These are items that people are eating all the time without realizing that it has fluoride in it. Because it's a pesticide residue that's allowed to be on produce now it's taken a big jump and the EPA has allowed it to be at really high levels, 180 ppm on a head of lettuce, 55 ppm on raisins. I mean no child is going to wash all that off."⁷⁸

Prepared baby foods are a problem, too. A 1997 article in the *Journal of the American Dental Association*⁷⁹ warns that some baby foods contain such high levels of fluoride that babies who eat the food risk dental fluorosis. "Any infants who regularly eat more than a couple of ounces of infant foods containing high-fluoride-content chicken would be at elevated fluorosis risk," the authors conclude.⁸⁰ Infants who eat large quantities of dry infant cereals reconstituted with fluoridated water could ingest substantial quantities of fluoride from this source, this study shows. "Children should also be monitored to make sure that they do not ingest too much fluoride from other sources such as fluoride dentifrice, dietary fluoride supplements or fluoridated water...."⁸¹

Fluoride exposure during infancy can be expected to increase risk of fluoride-related illness, since a recent study shows that the first year of life is the most critical period for fluoride exposure. Children exposed during the first year of life, and to a lesser extent in the second year, are far more likely to develop fluorosis than those whose exposure begins later. The early mineralizing teeth—the central incisors and first molars—are most likely to be affected.⁸²

This is confirmed by a recent study of fluorosis risk. "There is substantial evidence that fluoridated water, fluoride supplements, infant formulas, and fluoride toothpastes are risk factors for fluorosis," alone and together, reports Ohio State University researcher Dr. Ana Karina Mascarenhas.⁸³

A recent study of fluoridated and non-fluoridated communities in Brazil proved that fluoride toothpaste contributes to fluorosis. In the study, children who started using fluoride before the age of three were 4.43 times more likely to have dental fluorosis than those who started using it after the age of three.⁸⁴

Dr. Connett observes that "the level of fluoride put into water (1 ppm) is 100 times higher than normally found in mothers' milk (0.01 ppm). There are no benefits, only risks, for infants ingesting this heightened level of fluoride at such an early age (this is an age where susceptibility to environmental toxins is particularly high)."⁸⁵

Fluorosis gets worse as a child approaches puberty, according to study done in Norway. The study showed a significant increase in the severity of fluorosis with increasing age in a high fluoride community, whereas no change in severity with age was observed in a low fluoride community. Fluorosis resulting from high fluoride content of drinking water increases between the ages of ten and fourteen.⁸⁶ But beyond this is the larger issue that this study brings up: Is it wise to subject children and others who are heavy juice drinkers to additional fluoride in their water?

Here's a little-publicized reality: Cooking can greatly increase a food's fluoride content. Peas, for example, contain 12 micrograms of fluoride when raw and 1500 micrograms after they are cooked in fluoridated water, which is a tremendous difference. Furthermore, fluoride is an ingredient in pharmaceuticals, aerosols, insecticides, and pesticides.

And of course, toothpastes. It's interesting to note that in the 1950s, fluoridated toothpastes were required to carry warnings on their labels saying that they were not to be used in areas where water was already fluoridated. Crest toothpaste went so far as to write: "Caution: Children under 6 should not use Crest." These regulations were dropped in 1958, although no new research was available to prove that the overdose hazard no longer existed. Today, common fluoride levels in toothpaste are 1000 ppm. Research chemist Woodfun Ligon notes that swallowing a small amount adds substantially to fluoride intake. Dentists say that children commonly ingest up to 0.5 mg of fluoride a day from toothpaste.⁸⁷

Dr. Hardy Limeback cites studies conducted by the toothpaste manufacturers showing that children under the age of six typically swallow as much as 60 percent of the toothpaste that goes into their mouths. "The warning labels, in my personal opinion, are there to get them off the hook in the next ten years. People who have been exposed to too much fluoride ingestion before the tubes were labeled have a case against the toothpaste companies. They weren't told that a lifetime of fluoride ingestion may be harmful."⁸⁸

Which begs the question: How safe is all this fluoride? According to scientists and informed doctors, such as Dr. John Lee, it is not safe at all. Dr. Lee first took an anti-fluoridation stance back in 1972, when as chairman of an environmental health committee for a local medical society, he was asked to state their position on the subject. He stated that after investigating the references given by both pro- and anti-fluoridationists, the group discovered three important things:

"One, the claims of benefit of fluoride, the 60% reduction of cavities, was not established by any of these studies. Two, we found that the investigations into the toxic side effects of fluoride have not been done in any way that was acceptable. And three, we discovered that the estimate of the amount of fluoride in the food chain, in the total daily fluoride intake, had been measured in 1943, and not since then. By adding the amount of fluoride that we now have in the food chain, which comes from food processing with fluoridated water, plus all the fluoridated toothpaste that was not present in 1943, we found that the daily intake of fluoride was far in excess of what was considered optimal."⁸⁹

ESTABLISHED HEALTH RISKS

What happens when fluoride intake exceeds the optimal? The inescapable fact is that this substance has been associated with severe health problems, ranging from skeletal and dental fluorosis to bone fractures, to fluoride poisoning, and even to cancer.

Dental Fluorosis

The publication *Health Effects of Ingested Fluoride*, put out by the National Academy of Sciences, reports that in areas with optimally fluoridated water (1 ppm, either natural or added), dental fluorosis levels in recent years ranged from 8 to 51%. Recently, a prevalence of slightly over 80% was reported in children 12-14 years old in Augusta, Georgia.⁹⁰ Other research gives higher figures. In a report entitled "Trends in Prevalence of Dental Fluorosis in North America," studies found that 35% to 60% of people living in fluoridated communities experience dental fluorosis, while non-fluoridated areas figure from 20% to 45%.⁹¹ In 2010, CDC researchers found that the prevalence of dental fluorosis among adolescents aged 12-15 had actually increased for the years 1999-2004 compared to the years 1986-1987, rising from 22.6% to 40.7%.⁹²

Fluoride is a noteworthy chemical additive in that its officially acknowledged benefit and damage levels are about the same. Writing in *The Progressive*, science journalist Daniel Grossman elucidates this point: "Though many beneficial chemicals are dangerous when consumed at excessive levels, fluoride is unique because the amount that dentists recommend to prevent cavities is about the same as the amount that causes dental fluorosis."⁹³ One recent study even indicated that dental fluorosis was associated with "a more intense course of caries progression" in association with other factors.⁹⁴ Although the American Dental Association and the United States Government consider dental fluorosis only a cosmetic problem, the *American Journal of Public Health* says that "...brittleness of moderately and severely mottled teeth may be associated with elevated caries levels."⁹⁵ In other words, in these cases the fluoride is causing the exact problem that it's supposed to prevent. Yi mouyiannis adds, "In highly naturally-fluoridated areas, the teeth actually crumble as a result. These are the first visible symptoms of fluoride poisoning."⁹⁶

When considering dental fluorosis, there are factors beyond the physical that cannot be ignored - in particular, the negative psychological effects of having moderately to severely mottled teeth. These were recognized in a 1984 National Institute of Mental Health panel that looked into this problem.⁹⁷

A telling trend is that TV commercials for toothpaste, and toothpaste tubes themselves, are now downplaying fluoride content as a virtue.

This was noted in an article in the *Sarasota/Florida ECO Report*,⁹⁸

whose author, George Glasser, feels that manufacturers are distancing themselves from the additive because of fears of lawsuits. He points out that such a class action suit has already been filed in England against the manufacturers of fluoride-containing products on behalf of children suffering from dental fluorosis. The climate is ripe for similar litigation in the US, considering that the CDC is reporting anywhere from 1/3 to 1/2 of all American schoolchildren suffer from fluoride overdose and sport the pitted discoloration of dental fluorosis.⁹⁹ Still, certain segments of industry have yet to get the message. A recent newspaper ad campaign promotes Dannon's "Fluoride to Go" spring water "for kids who can't sit still."¹⁰⁰ Supplied in convenient kid-sized bottles with the pop-up "athletic" cap kids adore, the product perpetuates fluoride's false promise of better dental health for the new generation of kids for whom bottled water is more desirable than soda pop. The irony is that the shift from pop to water is one thing that does impact children's dental health significantly. Fluoride is totally out of place in this scenario. It makes one wonder how much fluoride might be in other brands of bottled water, including Evian and Volvic, which are owned by Dannon's parent company.

Skeletal Fluorosis

When fluoride is ingested, approximately 93% of it is absorbed into the bloodstream. A good part of the material is excreted, but the rest is deposited in the bones and teeth,¹⁰¹ and is capable of causing crippling skeletal fluorosis. This condition can damage the musculoskeletal and nervous systems and result in muscle wasting, limited joint motion, spine deformities, and calcification of the ligaments, as well as neurological deficits.¹⁰²

Large numbers of people in Japan, China, India, the Middle East, and Africa have been diagnosed with skeletal fluorosis from drinking naturally fluoridated water. In India alone, nearly a million people suffer from the affliction.¹⁰³ While only a dozen cases of skeletal fluorosis have been reported in the United States, *Chemical and Engineering News* states that "critics of the EPA standard speculate that there probably have been many more cases of fluorosis - even crippling fluorosis - than the few reported in the literature because most doctors in the U.S. have not studied the disease and do not know how to diagnose it."¹⁰⁴ Because some symptoms of skeletal fluorosis mimic those of arthritis, the first two clinical phases of fluorosis can be easily misdiagnosed.¹⁰⁵ According to Dr. Paul Connett, the causes of most forms of osteoarthritis are unknown. It is not implausible that the high prevalence of arthritis in America (42 million Americans have it) may be related to our high levels of fluoride intake.¹⁰⁶

Dr. Hardy Limeback says, "We're quite concerned that fluoride accumulates through a lifetime of water fluoridation and causes the bone to become more brittle. We've started a study, and we're close to publishing it, that shows that people who have been exposed to just 20 to 30 years of water fluoridation have twice the amount of fluoride in their bones. Now there are all kinds of epidemiological studies to show that people who live in fluoridated areas have a higher risk for hip and other kinds of fractures, such as forearm fractures when they fall down. So this is quite a concern. I personally don't think that we need to be ingesting fluoride to protect our kids' teeth because they're already protected at a maximum. The rest of us are swallowing all this fluoride from the drinking water and possibly increasing the risk for bone fracture. It just doesn't make sense at all."¹⁰⁷

Radiological changes in bone occur when fluoride exposure is 5 mg/day, according to the late Dr. George Waldbott, author of *Fluoridation: The Great Dilemma*. While this 5 mg/day level is the amount of fluoride ingested by most people living in fluoridated areas,¹⁰⁸ the number increases for diabetics and laborers, who can ingest up to 20 mg of fluoride daily. In addition, a survey conducted by the Department of Agriculture shows that 3% of the US population drinks 4 liters or more of water every day. If these individuals live in areas where the water contains a fluoride level of 4 ppm, allowed by the EPA, they are ingesting 16 mg/day from the consumption of water alone, and are thus at greater risk for getting skeletal fluorosis.¹⁰⁹

Bone Fractures

At one time, fluoride therapy was recommended for building denser bones and preventing fractures associated with osteoporosis. Because fluoride has been strongly associated with bone fragility and breakage, several articles in peer-reviewed journals now suggest that fluoride actually causes more harm than good. Three studies reported in *The Journal of the American Medical Association* showed links between hip fractures and fluoride.^{110, 111, 112} Findings included "a small but significant increase in the risk of hip fractures in both men and women exposed to artificial fluoridation at 1 ppm."¹¹³ In addition, the *New England Journal of Medicine* reports that people given fluoride to cure their osteoporosis actually wound up with an increased non-vertebral fracture rate.¹¹⁴ Austrian researchers have also found that fluoride tablets make bones more susceptible to fractures.¹¹⁵ In 2002, Belgium banned sales of fluoride tablets, gum, and drops after commissioning a study that revealed they could promote osteoporosis.¹¹⁶ The U.S. National Research Council states that the U.S. hip fracture rate is now the highest in the world.¹¹⁷

A 2000 article in the journal *Fluoride* describes the bone effects of fluoride in detail.¹¹⁸ Fluoride may increase bone quantity (osteofluorosis, osteosclerosis) but also decrease bone quality and bone strength. It is well known that pharmacological doses of fluoride increase the risk of torsion-type fractures (such as hip fractures) despite the appearance of greater bone density. Conventional medicine interprets the

observed fluoride-induced increase of serum alkaline phosphatase concentration as a sign of osteoblast activity. Actually, it is a reflection of increased mortality of osteocytes within bone. Osteocytes are rich in alkaline phosphatase, which is released when the cells are killed by fluoride. It is unlikely, therefore, that a window of fluoride-induced bone benefit exists.¹¹⁹

Louis V. Avioli, professor at the Washington University School of Medicine, says in a 1987 review of the subject: "Sodium fluoride therapy is accompanied by so many medical complications and side effects that it is hardly worth exploring in depth as a therapeutic mode for postmenopausal osteoporosis, since it fails to decrease the propensity for hip fractures and increases the incidence of stress fractures in the extremities."¹²⁰

Fluoride's deleterious effect on bone is well documented. Early experiments using large doses of fluoride as a treatment for osteoporosis had disastrous results. Dr. C. Rich warned that rather than strengthening bones, fluoride could cause osteoarthritis, as well as gastric pain, calcification of the arteries, and visual disturbances.¹²¹

Dr. Paul Connett cites two epidemiological studies suggesting a possible association with osteosarcoma, bone cancer, in young men living in fluoridated areas.¹²²

One is the report of the U.S. National Toxicology Program mentioned earlier, which first uncovered the epidemiological evidence of increased osteosarcoma in boys and young men living in fluoridated areas.¹²³

The second is a study conducted by the New Jersey Department of Health. Dr. Perry Cohn studied the incidence of the rare bone cancer in seven New Jersey counties relative to water fluoridation. In fluoridated areas, incidence of osteosarcoma in boys under the age of ten was 4.6 times higher than in un-fluoridated areas; it was 3.5 times higher in the 10 to 19 age group, and over twice as high in the 20 to 49 age group.¹²⁴

Scientists at Yale University discovered that doses as low as 1 ppm of fluoride decrease bone strength and elasticity, making fracture more likely.¹²⁵ Another group of researchers found that fluoride accelerated the development of osteoporosis.¹²⁶ A 1992 study of elderly patients found "a small but significant increase in the risk of hip fracture in both men and women exposed to artificial fluoridation at 1 part per million." As with bone cancer, the adverse effects of fluoride accumulation on bone strength were greater with men.¹²⁷

Fluoride has the potential to increase skeletal mass to a greater extent than any other pharmacologic agent, yet it has proven difficult to translate this into therapeutic benefit for patients with low bone mass in diseases such as osteoporosis, according to a 1996 study by Michigan's Center for Osteoporosis Research. This apparent paradox can be explained in part by toxic actions of the ion on skeletal mineralization, impairment of the normal processes of bone re-absorption, and fluoride-induced decreases in strength per unit of bone (mass or volume).¹²⁸

Belgian arthritis researchers reviewed thirty years clinical research on fluoride in the treatment of osteoporosis. They point out that fluoride has a dual effect on osteoblasts (the cells from which bones are made). On the one hand, it increases the birthrate of osteoblasts, while on the other hand it has a toxic effect on the individual cell with mineralization impairment and reduced apposition rate resembling osteomalacia. Fluoride has a positive effect on axial bone density, they say, but the axial bone gain is not matched by similar changes in cortical bone (the hard outer part of bone where a bone's main strength lies).¹²⁹

Among the studies cited, two show an increased rate of hip fracture among patients treated with high doses of fluoride (50-75 mg per day).^{130,131}

In an experiment conducted with bovine bones, fluoride treatment reduced the mechanical strength of bone tissue by converting small amounts of bone mineral to mostly calcium fluoride. This action reduces the structurally effective bone mineral content and also possibly affects the interface bonding between the bone mineral and the organic matrix of the bone tissue.¹³² A Polish study published in 1999 found that treatment with fluoridated water decreases the bending strength of the femoral neck and shaft in laboratory rats.

A New Zealand review of recent scientific literature reveals a consistent pattern of evidence--hip fractures, skeletal fluorosis, the effect of fluoride on bone structure, fluoride levels in bones and osteosarcomas--pointing to the existence of causal mechanisms by which fluoride damages bones. Public health authorities in Australia and New Zealand have appeared reluctant to consider openly and frankly the implications of this and earlier scientific evidence unfavorable to the continuation of the fluoridation of drinking water supplies.¹³³

Dr. Connett reports that, of 19 studies conducted since 1990, 11 have found an association between water fluoridation and hip fractures in the elderly.¹³⁴

One study found a dose-related increase in hip fracture as the concentration of fluoride rose from 1 ppm to 8 ppm. Hip fracture is a very serious issue for the elderly, as a quarter of those who have a hip fracture die within a year of the operation, while 50 percent never regain an independent existence.¹³⁵

In 2009, the Iowa Fluoride Study revealed that girls exposed to the highest fluoride levels over the course of 11 years persistently displayed lower bone mineral content and density than their peers in the lowest-exposed group. At 8.5 years old, they had 6.4% less bone mineral content in their hips and 4% less through their whole bodies; these numbers had shifted to 5.7% less and 4.3% less, respectively, by age 11.¹³⁶

Fluoride Poisoning

In May 1992, 260 people were poisoned, and one man died, in Hooper Bay, Alaska, after drinking water contaminated with 150 ppm of fluoride. The accident was attributed to poor equipment and an unqualified operator.¹³⁷ Was this a fluke? Not at all. Over the years, the CDC has recorded several incidents of excessive fluoride permeating the water supply and sickening or killing people. We don't usually hear about these occurrences in news reports, but interested citizens have learned the truth from data obtained under the Freedom of Information Act. Here is a partial list of toxic spills we have not been told about:

July 1993 -Chicago, Illinois: Three dialysis patients died and five experienced toxic reactions to the fluoridated water used in the treatment process. The CDC was asked to investigate, but to date there have been no press releases.

May 1993 - Kodiak, Alaska (Old Harbor): The population was warned not to consume water due to high fluoride levels. They were also cautioned against boiling the water, since this concentrates the substance and worsens the danger. Although equipment appeared to be functioning normally, 22-24 ppm of fluoride was found in a sample.

July 1992 -Marin County, California: A pump malfunction allowed too much fluoride into the Bon Tempe treatment plant. Two million gallons of fluoridated water were diverted to Phoenix Lake, elevating the lake surface by more than two inches and forcing some water over the spillway.

December 1991 - Benton Harbor, Michigan: A faulty pump allowed approximately 900 gallons of hydrofluosilicic acid to leak into a chemical storage building at the water plant. City engineer Roland Klockow stated, "The concentrated hydrofluosilicic acid was so corrosive that it ate through more than two inches of concrete in the storage building." This water did not reach water consumers, but fluoridation was stopped until June 1993. The original equipment was only two years old.

July 1991 - Porgate, Michigan: After a fluoride injector pump failed, fluoride levels reached 92 ppm and resulted in approximately 40 children developing abdominal pains, sickness, vomiting, and diarrhea at a school arts and crafts show.

November 1979 - Annapolis, Maryland: One patient died and eight became ill after renal dialysis treatment. Symptoms included cardiac arrest (resuscitated), hypotension, chest pain, difficulty breathing, and a whole gamut of intestinal problems. Patients not on dialysis also reported nausea, headaches, cramps, diarrhea, and dizziness. The fluoride level was later found to be 35 ppm; the problem was traced to a valve at a water plant that had been left open all night.¹³⁸

Instead of addressing fluoridation's problematic safety record, officials have chosen to cover it up. For example, the ADA says in one

booklet distributed to health agencies that "Fluoride feeders are designed to stop operating when a malfunction occurs... so prolonged over-fluoridation becomes a mechanical impossibility."¹³⁹

In addition, the information that does reach the population after an accident is woefully inaccurate. A spill in Annapolis, Maryland, placed thousands at risk, but official reports reduced the number to eight.¹⁴⁰

Perhaps officials are afraid they will invite more lawsuits like the one for \$480 million by the wife of a dialysis patient who became brain-injured as the result of fluoride poisoning.

Not all fluoride poisoning is accidental. For decades, industry has knowingly released massive quantities of fluoride into the air and water. Disenfranchised communities, with people least able to fight back, are often the victims. Medical writer Joel Griffiths relays this description of what industrial pollution can do, in this case to a devastatingly poisoned Indian reservation:

"Cows crawled around the pasture on their bellies, inching along like giant snails. So crippled by bone disease they could not stand up, this was the only way they could graze. Some died kneeling, after giving birth to stunted calves. Others kept on crawling until, no longer able to chew because their teeth had crumbled down to the nerves, they began to starve...." They were the cattle of the Mohawk Indians on the New York-Canadian St. Regis Reservation during the period 1960-1975, when industrial pollution devastated the herd - and along with it, the Mohawks' way of life. ...Mohawk children, too, have shown signs of damage to bones and teeth."¹⁴¹

Mohawks filed suit against the Reynolds Metals Company and the Aluminum Company of America (Alcoa) in 1960, but ended up settling out of court, where they received \$650,000 for their cows.¹⁴²

Cancer

Numerous studies demonstrate links between fluoridation and cancer; however, agencies promoting fluoride consistently refute or cover up these findings.

Even in the earliest days of fluoridation, there were clear indications of the fluoride-cancer link. In the early 1950s, Dr. Alfred Taylor, a biochemist at the University of Texas, conducted a series of experiments in which cancer-prone mice consuming water treated with sodium fluoride were found to have shorter life spans than similar mice drinking distilled water.¹⁴³ Taylor's studies were carried out twice, because after the first run the scientist himself discovered that the chow that his mice had eaten had itself contained fluoride, thus clouding the results. On his own initiative, Taylor ran the whole experiment a second time. The second run, with mice fed fluoride-free chow, was conclusive. Clearly fluoride could no longer be considered a harmless additive to drinking water.¹⁴⁴

John Remington Graham and Pierre-Jean Morin, in their exhaustive survey of fluoridation litigation,¹⁴⁵ observe that "Taylor's work was published at a politically sensitive time, because the last stages of the much-boasted surveys at Newburgh and Kingston were underway.

The obvious meaning of Dr. Taylor's results was that a possible danger to human health had been overlooked, and that widespread fluoridation should be delayed until the situation had been clarified. However, the ADA and the USPHS had already endorsed and begun the drive to promote fluoridation."¹⁴⁶

What happened next is a classic study in denial. The Final Report published by the authors of the Newburgh-Kingston study refers only to the results of Taylor's first round of tests, even though his second, conclusive round had been peer-reviewed and published over two years before. They wrote:

"The reports by Alfred Taylor, a biochemist at the University of Texas, on the increased incidence of cancer in mice drinking fluoride treated water have been shown to be unfounded, since the food he was giving the mice had many times the fluoride content of drinking water, and the food was supplied to both the control and the experimental groups. Subsequent tests did not confirm the differences."¹⁴⁷

And this same denial has been repeated over and over for the succeeding 45 years by the United States Public Health Service and its affiliates. Graham and Morin cite a standard history of the National Institute of Dental Research, published over 35 years later, alleging that Dr. Taylor refrained from publishing his findings "because he was unable to confirm those results in a second experiment."¹⁴⁸ The author of this fabrication goes on to say that "a literature search of scientific journals failed to show any publication of this work by Taylor..."¹⁴⁹ Legal scholars Graham and Morin comment: "The most powerful forensic evidence of the importance of Dr. Taylor's work is that the USPHS officials have done so much to conceal it."¹⁵⁰

That would not be the last study to reveal fluoride's carcinogenic effects, nor would it be the last fluoride-related cover-up. In 1977, Dr. John Yiamouyiannis and Dr. Dean Burk, former chief chemist at the National Cancer Institute, released a study that linked fluoridation to 10,000 cancer deaths per year in the US. Their inquiry, which compared cancer deaths in the ten largest fluoridated American cities to those in the ten largest un-fluoridated cities between 1940 and 1950, discovered a 5% greater rate in the fluoridated areas.¹⁵¹ The NCI disputed these findings, since an earlier analysis of theirs apparently failed to pick up these extra deaths. Federal authorities claimed that Yiamouyiannis and Burk were in error, and that any increase was caused by statistical changes over the years in age, gender, and racial composition.¹⁵² In order to settle the question of whether or not fluoride is a carcinogen, a Congressional subcommittee instructed the National Toxicology Program (NTP) to perform another investigation.¹⁵³ That study, due in 1980, was not released until 1990. However, in 1986, while the study was delayed, the EPA raised the standard fluoride level in drinking water from 2.4 to 4 ppm.¹⁵⁴ After this step, some of the government's own employees in NFFE Local 2050 took what the Oakland Tribune termed the "remarkable step of denouncing that action as political."¹⁵⁵

When the NTP study results became known in early 1990, union president Dr. Robert Carton, who worked in the EPA's Toxic Substances Division, published a statement. It read, in part:

"Four years ago, NFFE Local 2050, which represents all 1100 professionals at EPA headquarters, alerted then-Administrator Lee Thomas to the fact that the scientific support documents for the fluoride in drinking water standard were fatally flawed. The fluoride juggernaut proceeded as it apparently had for the last 40 years - without any regard for the facts or concern for public health.

EPA raised the allowed level of fluoride before the results of the rat/mouse study ordered by Congress in 1977 was complete. Today, we find out how irresponsible that decision was. The results reported by NTP, and explained today by Dr. Yiamouyiannis, are, as he notes, not surprising considering the vast amount of data that caused the animal study to be conducted in the first place. The results are not surprising to NFFE Local 2050 either. Four years ago we realized that the claim that there was no evidence that fluoride could cause genetic effects or cancer could not be supported by the shoddy document thrown together by the EPA contractor.

It was apparent to us that EPA bowed to political pressure without having done an in-depth, independent analysis, using in-house experts, of the currently existing data that show fluoride causes genetic effects, promotes the growth of cancerous tissue, and is likely to cause cancer in humans. If EPA had done so, it would have been readily apparent - as it was to Congress in 1977 - that there were serious reasons to believe in a cancer threat.

The behavior by EPA in this affair raises questions about the integrity of science at EPA and the role of professional scientists, lawyers and engineers who provide the interpretation of the available data and the judgments necessary to protect the public health and the environment. Are scientists at EPA there to arrange facts to fit preconceived conclusions? Does the Agency have a responsibility to develop world-class experts in the risks posed by chemicals we are exposed to every day, or is it permissible for EPA to cynically shop around for contractors who will provide them the 'correct' answers?¹⁵⁶

What were the NTP study results? Out of 130 male rats that ingested 45 to 79 ppm of fluoride, 5 developed osteosarcoma, a rare bone cancer. There were cases, in both males and females at those doses, of squamous cell carcinoma in the mouth.¹⁵⁷ Both rats and mice had dose-related fluorosis of the teeth, and female rats suffered osteosclerosis of the long bones.¹⁵⁸

When Yiamouyiannis analyzed the same data, he found mice with a particularly rare form of liver cancer, known as hepatocholangiocarcinoma. This cancer is so rare, according to Yiamouyiannis, that the odds of its appearance in this study by chance are

1 in 2 million in male mice and 1 in 100,000 in female mice.¹⁵⁹ He also found precancerous changes in oral squamous cells, an increase in squamous cell tumors and cancers, and thyroid follicular cell tumors as a result of increasing levels of fluoride in drinking water.¹⁶⁰

A March 13, 1990, New York Times article commented on the NTP findings:

"Previous animal tests suggesting that water fluoridation might pose risks to humans have been widely discounted as technically flawed, but the latest investigation carefully weeded out sources of experimental or statistical error, many scientists say, and cannot be discounted."¹⁶¹

In the same article, biologist Dr. Edward Groth notes: "The importance of this study...is that it is the first fluoride bioassay giving positive results in which the latest state-of-the-art procedures have been rigorously applied... It has to be taken seriously."¹⁶²

On February 22, 1990, the Medical Tribune, an international medical news weekly received by 125,000 doctors, offered the opinion of a federal scientist who preferred to remain anonymous:

"It is difficult to see how EPA can fail to regulate fluoride as a carcinogen in light of what NTP has found. Osteosarcomas are an extremely unusual result in rat carcinogenicity tests. Toxicologists tell me that the only other substance that has produced this is radium....The fact that this is a highly atypical form of cancer implicates fluoride as the cause. Also, the osteosarcomas appeared to be dose-related, and did not occur in controls, making it a clean study."¹⁶³

Public health officials were quick to assure a concerned public that there was nothing to worry about. The ADA said the occurrence of cancers in the lab may not be relevant to humans since the level of fluoridation in the experimental animals' water was so high. But the Federal Register, which is the handbook of government practices, disagrees: "The high exposure of experimental animals to toxic agents is a necessary and valid method of discovering possible carcinogenic hazards in man. To disavow the findings of this test would be to disavow those of all such tests, since they are all conducted according to this standard."¹⁶⁴

As a February 5, 1990, Newsweek article pointed out, "such mega dosing is standard toxicological practice. It's the only way to detect an effect without using an impossibly large number of test animals to stand in for the humans exposed to the substance."¹⁶⁵ And as the Safer Water Foundation explains, higher doses are generally administered to test animals to compensate for the animals' shorter life span and because humans are generally more vulnerable than test animals on a body-weight basis.¹⁶⁶

Several other studies link fluoride to genetic damage and cancer. An article in Mutation Research says that a study by Proctor and Gamble, the very company that makes Crest toothpaste, did research showing that 1 ppm fluoride causes genetic damage.¹⁶⁷ Results were never published but Proctor and Gamble called them "clean," meaning animals were supposedly free of malignant tumors. Not so, according to scientists who believe some of the changes observed in test animals could be interpreted as precancerous.¹⁶⁸ Yiamouyiannis says the Public Health Service sat on the data, which were finally released via a Freedom of Information Act request in 1989. "Since they are biased, they have tried to cover up harmful effects," he says. "But the data speaks for itself. Half the amount of fluoride that is found in the New York City drinking water causes genetic damage."¹⁶⁹

A National Institutes of Environmental Health Sciences publication, Environmental and Molecular Mutagenesis, also linked fluoride to genetic toxicity when it stated that "in cultured human and rodent cells, the weight of evidence leads to the conclusion that fluoride exposure results in increased chromosome aberrations."¹⁷⁰ The result of this is not only birth defects but the mutation of normal cells into cancer cells. The Journal of Carcinogenesis further states that "fluoride not only has the ability to transform normal cells into cancer cells but also to enhance the cancer-causing properties of other chemicals."¹⁷¹

In 1991, the PHS put out a report called "Review of fluoride: benefits and risks," in which they showed a substantially higher incidence of bone cancer in young men exposed to fluoridated water compared to those who were not. The New Jersey Department of Health also found that the risk of developing bone cancer was 6.9 times as high in fluoridated areas as in non-fluoridated areas.¹⁷²

Despite cover-up attempts, the light of knowledge is filtering through to some enlightened scientists. Regarding animal test results, the director of the U.S. National Institute of Environmental Health Sciences, James Huff, does say that "the reason these animals got a few osteosarcomas was because they were given fluoride...Bone is the target organ for fluoride."¹⁷³ Toxicologist William Marcus adds that "fluoride is a carcinogen by any standard we use. I believe EPA should act immediately to protect the public, not just on the cancer data, but on the evidence of bone fractures, arthritis, mutagenicity, and other effects."¹⁷⁴

The Environmental Working Group (EWG) was a vocal opponent of the fluoride cover-up. In a letter referring to a 2005 Harvard University study, EWG's Senior Vice President Richard Wiles requested that the National Toxicology Program declare fluoride in tap water a known or probable cancer cause.¹⁷⁵ Expressing a similar sentiment to British newspaper The Observer, Wiles stated "I've spent 20 years in public health trying to protect kids from toxic exposure. Even with DDT, you don't have the consistently strong data that the compound can cause cancer as you now have with fluoride".¹⁷⁶ The study that got the EWG talking became available in 2001 and clearly linked fluoride in tap water, at levels common in most of America, to a rare form of bone cancer called osteosarcoma.¹⁷⁷ In 2006, that study's author, E.B Bassin, published a second paper confirming the link between osteosarcoma in young males and childhood exposure to fluoride in drinking water.¹⁷⁸

Paul Connett notes that "some of the earliest opponents of fluoride were biochemists and at least 14 Nobel Prize winners are among numerous scientists who have expressed their reservations about the practice of fluoridation."¹⁷⁹ He cites Dr. James Sumner, who won the Nobel Prize for his work on enzyme chemistry, who says, "We ought to go slowly. Everybody knows fluorine and fluoride are very poisonous substances...We use them in enzyme chemistry to poison enzymes, those vital agents in the body. That is the reason things are poisoned; because the enzymes are poisoned and that is why animals and plants die."¹⁸⁰

It is instructive to note that the fluoride compounds that are added to our drinking water are not pharmaceuticals. They are direct, unfiltered waste products of the aluminum and fertilizer industries. Hydrofluorosilicic acid, one of the gases that once billowed in toxic clouds from fertilizer plants, is now scrubbed from the factory exhaust and packaged to be shipped around the country and added to your municipal water supply.

Fluoride and Lead

Fluoride and its various compounds are toxic all by themselves, but its interaction with other toxic metals is of increasing concern. Research published in the December 2000 issue of the journal NeuroToxicology warns that public drinking water treated with sodium silicofluoride or fluorosilicic acid (FSA), known as silicofluorides (SiFs), is linked to higher uptake of lead in children.¹⁸¹ Less than 10% of fluoridation systems in the US use sodium fluoride, the substance first used to fluoridate public drinking water in 1945. SiF's are instead used to treat drinking water for 140 million Americans. Yet the safety of SiFs has never been tested, nor have they been approved by the FDA.

The research was conducted by a team led by Roger D. Masters, Dartmouth College Research Professor and Nelson A. Rockefeller Professor of Government Emeritus, and Myron J. Coplan, a consulting chemical engineer, formerly Vice President of Albany International Corporation. The team studied the blood lead levels in over 400,000 children in three different samples, finding a significant link between SiF-treated water and elevated blood lead levels. They discovered that children were most likely to display elevated blood lead levels when they were exposed both to known risk factors, such as old house paint and lead in soil or water, and to SiF-treated drinking water.¹⁸² FSA's synergistic role in bolstering blood lead levels was confirmed in a 2010 study that exposed rats to a combination of FSA and lead in drinking water, causing three times the uptake of lead into the rats' bloodstream as exposing them to lead alone.¹⁸³ Aside from the corrosive effects of lowering the water's pH by adding FSA, the substance's "unique affinity for lead" leaches the metal from pipes or fixtures containing even small amounts of lead, such as brass fixtures and pipes. Combining FSA with chloramine, a disinfectant commonly used to treat drinking water, produced an even greater spike in lead levels.¹⁸⁴ Lead, in turn, amplifies the effects of FSA, increasing the

severity of dental fluorosis, which was shown in a recent Chinese study to correlate with fluoride-related reduction in IQ - the closest possible marker to a visual representation of the loss of "excellent intelligence."¹⁸⁵ Given lead's established neurotoxicity, a synergistic effect with that of fluoride is to be expected.¹⁸⁶

"Our research needs further laboratory testing," said Masters. "This should have the highest priority because our preliminary findings show correlations between SiF use and more behavior problems due to known effects of lead on brain chemistry." Also requiring further examination is German research that shows SiFs inhibit cholinesterase, an enzyme that plays an important role in regulating neurotransmitters.¹⁸⁷

"If SiFs are cholinesterase inhibitors, this means that SiFs have effects like the chemical agents linked to Gulf War Syndrome, chronic fatigue syndrome and other puzzling conditions that plague millions of Americans," said Masters. "We need a better understanding of how SiFs behave chemically and physiologically."¹⁸⁸

"We should stop using silicofluorides in our public water supply until we know what they do," says Masters.¹⁸⁹ In 2006, he reiterated his misgivings, emphasizing that not only do SiFs increase the absorption of environmental lead, a dopamine-depressing neurotoxin that has been linked to violent behavior, lack of impulse control, and learning deficits, but SiFs themselves, which were never proven safe for consumption before they replaced sodium fluoride in the water supply, are also linked with violent behavior. In an editorial for *Fluoride* magazine, Masters implored the Office of Environmental Health Hazard Assessment, "Given the costs of incarcerating violent criminals, these side-effects justify a moratorium on using silicofluorides for water treatment until they are shown to be safe."¹⁹⁰

The synergistic and potentiating health and behavioral effects of lead and fluoride disproportionately affect low-income communities, who are less likely to be able to afford alternate sources of water and less likely to have access to proper medical treatment for any fluoride-induced conditions they may develop through tainted water consumption. The catastrophic situation in Flint, Michigan, whereby unelected "emergency managers" responding to the state's budget crisis carelessly if inadvertently inflicted massive lead poisoning on an entire metropolitan area, is just the tip of the iceberg regarding the possible harm inflicted on these populations by water fluoridation.

In April 2014, Flint's unelected emergency manager, appointed by austerity-minded governor Rick Snyder to manage the financially ailing municipality, opted to save a few bucks by buying water from the notoriously dirty Flint River. Ignoring complaints of discoloration, strange odors and taste, rust, e.coli, rashes, hair loss, and vision loss from residents, the Michigan Department of Environmental Quality insisted the water was fit to drink (but added that residents should boil it anyway - a process which actually increases lead and fluoride concentrations in water, as the metals do not boil off). The EPA sat on an incriminating report by Virginia Tech professor Marc Edwards for five months. The state tried to soothe citizens' worries publicly while privately supplying its employees with bottled water. By the time Flint reconnected to the Detroit water grid in October 2016, thousands of children had been poisoned, and in a cruel irony, replacing the heavily-corroded pipes will cost the state much more than it would have spent on Detroit water during those two years.¹⁹¹

Lead may have gotten primary billing in the Flint tragedy, but water fluoridation compounded the damage. Flint was not the first community to suffer because of the country's unscientific devotion to medical orthodoxy, and it will not be the last. Flint is the result when a community values its bottom line more than its citizens.

Fluoride and Aluminum

Lead isn't the only metal that interacts with fluoride in a toxic combination. Aluminum is another.

In 1976, Dr. D. Allman and coworkers from Indiana University School of Medicine fed animals 1 part-per-million (ppm) fluoride and found that in the presence of aluminum, in a concentration as small as 20 parts per billion, fluoride is able to cause an even larger increase in cyclic AMP levels. Cyclic AMP inhibits the migration rate of white blood cells, as well as the ability of the white blood cell to destroy pathogenic (disease-causing) organisms. The fact that fluoride toothpastes and school based mouth rinses are packaged in aluminum accentuates the effect on the body.¹⁹²

Research conducted by Mullenix and colleagues in 1995 indicated that rats treated with low doses of fluoride cause sex- and dose-specific behavioral aberrations with a common pattern.¹⁹³ Prenatal rats exposed became hyperactive, while those exposed post-natal became hypoactive. This effect was confirmed by a 2001 study in which administration of sodium fluoride with drinking water produced both behavioral and dental toxicities. A suppression of spontaneous motor activity, a shortening of Rota-rod endurance time, a decreased body weight gain and food intake, a suppression of total cholinesterase and acetyl cholinesterase activities and dental lesion were observed in test animals. Serum fluoride concentration was raised markedly and that of calcium was decreased in the animals.¹⁹⁴

A 1998 study by Julie A. Varner and colleagues at the Psychology Department of Binghamton University (NY) shows that neurotoxic effects like these are enhanced by the synergetic action of fluoride and aluminum.¹⁹⁵ Varner describes "alterations in the nervous system resulting from chronic administration of the fluoroaluminum complex or equivalent levels of fluoride in the form of sodium-fluoride. The rats were given fluoride in drinking water at the same level deemed "optimal" by pro-fluoridation groups, namely 1 part per million (1 ppm). Most pronounced damage was seen in animals that got the fluoride in conjunction with aluminum. The pathological changes found in the brain tissue of the animals were similar to the alterations found in the brains of people with Alzheimer's disease and dementia. The authors speculate that fluoride enables aluminum to cross the blood-brain barrier. These results are especially disturbing because of the low dose level of fluoride that shows the toxic effect in rats - rats are more resistant to fluoride than humans."¹⁹⁶

Another study done in Czechoslovakia adds force to the idea that aluminum may act synergistically with fluoride to trigger the mechanisms of Alzheimer's disease. The study shows that some of pathologic changes associated with AD are not induced by aluminum alone, but by the aluminofluoride complexes. These complexes may act as the initial signal stimulating impairment of homeostasis, degeneration and death of the cells. By influencing energy metabolism these complexes can accelerate the aging and impair the functions of the nervous system. "In respect to the etiology of AD, the long term action of aluminofluoride complexes may represent a serious and powerful risk factor for the development of AD," the authors conclude.¹⁹⁷

Those who are under the belief that fluoride would rarely interact with aluminum have been misled. Fluoride is, in fact, a direct byproduct of aluminum production. Aluminum is often added to drinking water as a flocculating agent by the same local water authorities who oversee the fluoridation of water. Aluminum and fluoride form a number of complexes, the most deadly of these being aluminum tetrafluoride.¹⁹⁸

Czech researchers have shown that the body reacts to aluminum tetrafluoride as if it were a phosphate ion capable of triggering G proteins. G-proteins are water-soluble substances (i.e. hormones, neurotransmitters, and growth factors) that transmit messages from the outside to the inside of a cell.¹⁹⁸ Aluminum tetrafluoride is capable of switching on G proteins without hormones, neurotransmitters, or growth factors present.¹⁹⁹ "This, notes Paul Connett, 'is the most worrisome aspect of fluoride subtle biochemistry.'²⁰⁰

Fluoride and the Pineal Gland

Another concern is fluoride's effect on the pineal gland, a small but powerful structure located between the right and left hemispheres of the brain. The pineal gland secretes melatonin, a hormone that affects such functions as sleep cycles, jet lag, hibernation in animals, immunity, and the onset of puberty. Jennifer Luke, Ph.D., found that the pineal gland attracts fluoride, which thereby interferes with melatonin's functions.²⁰¹ In autopsy studies she discovered extremely high concentrations of fluoride in the gland, averaging 9,000 ppm, and going up to 21,000 ppm in some cases.²⁰² And in an accompanying study of fluoride-treated Mongolian gerbils (the animal considered most favorable for studying effects on the pineal gland) Luke found lower levels of melatonin and earlier onset of puberty.

This research is highly suggestive. People with insomnia could be suffering as a result of fluoride's interference with melatonin production. Currently more than half the population of the United States suffers from some form of sleep disturbance.²⁰³ Sleep deprivation promotes reduced immunity. Sleep-challenged people are more likely to suffer depression, stroke, or heart disease than their well-rested peers.

Numerous studies have correlated insufficient melatonin production with an earlier-than-usual onset of puberty.^{204, 205} This recalls the 1955 Newburgh-Kingston study, which produced some extremely puzzling results that scientists have yet to explain. One was the finding that girls in fluoridated Newburgh were reaching menstruation five months earlier on average than the girls in un-fluoridated Kingston. This raises the question; does fluoride contribute to the alarming rates of early puberty that we are seeing?²⁰⁶ Premature menstruation is associated with a variety of ills, including breast cancer and obesity. A 2001 study published in the American Journal of Public Health reveals that early maturation nearly doubled the odds of being obese.²⁰⁷

Reproductive Effects

Fluoride has long been known to undermine fertility in animals and man.²⁰⁸ In 1951 commercial chinchilla breeder named W.R. Cox reported reproductive anomalies in commercially raised chinchillas fed with a high-fluoride animal feed.²⁰⁹ When Cox changed to a low-fluoride feed, "there were increases in the number of offspring born; the number of litters, and the numbers born alive. The adult mortality rate decreased from 14.6% in 1951 to 3.3% in 1952. A number of abnormalities associated with fluoride-contaminated feed were passed on through multiple generations."²¹⁰

Cox, a layman, studied the scientific literature, and found more than 1400 studies indicating fluoride's adverse effect on animals, especially soft tissue damage. Cox was surprised to find that the scientists advocating public water fluoridation at the time showed no interest in these studies or their possible implications for human health.²¹¹

SC Freni participated in a 1991 USPHS review of the toxicity of fluoride. Searching for studies that correlated fluoride exposure with reproductive effects in humans, he discovered that in almost 50 years of fluoridation, no one had ever studied fluoride's effect on the human fetus.²¹²

Freni's 1994 review of fluoride toxicity the National Center for Toxicological Research showed decreased fertility in most animal species studied. Freni then investigated whether fluoride would also affect human birth rates. He studied counties in which the water had a fluoride content of more than 3 ppm. Most regions he studied showed an association of decreasing total fertility rates (TFR) with increasing fluoride levels. There was no evidence that this outcome resulted from selection bias, inaccurate data, or improper analytical methods.²¹³ Freni speculated that fluoride might lower protein synthesis in osteoblasts or that it inhibits the adenylyl cyclase system in human spermatozoa.²¹⁴

In a 1994 study of mature rats treated with sodium fluoride, Narayana and Chinoy²¹⁵ found that fluoride interferes with androgenesis and damaged the testes by inhibiting the action of testosterone. Another study by the same team studied human spermatozoa treated with 25, 50,

and 250 mm of fluoride for 5, 10, and 20 minutes. Silver nitrate staining of fluoride-treated sperm revealed elongated heads, de-flagellation, and loss of the acrosome together with coiling of the tail. Sperm glutathione levels also showed a time-dependent decrease with complete depletion after 20 minutes, indicating rapid glutathione oxidation in detoxification of the NaF. The altered lysosomal enzyme activity and glutathione levels together with morphologic anomalies resulted in a significant decline in sperm motility with an effective dose of 250 mm.²¹⁶

In 2003, a study comparing men with heavy fluoride exposure (3-27 mg/day) to those with lower exposure (2-13 mg/day) found a significant increase in the reproductive hormone FSH and a significant reduction in free testosterone, inhibin-B, and prolactin, suggesting a fluoride-induced toxic effect on gonadotrophs and Sertoli cells.²¹⁷

Fluoride and Intelligence

Several studies link fluoride exposure to adverse effects on intelligence.

As far back as April 1944, as part of the secret Manhattan Project, there was a memo passed around stating, "Clinical evidence suggests that C616 [uranium hydrofluoride] may have a rather marked central nervous system effect with mental confusion, drowsiness and lassitude."²¹⁸ Through the following decades, numerous scientific studies determined the same thing: Fluorosis affects the nervous system and membrane lipids.

One investigation conducted in China measured the intelligence of children aged 8 to 13 with non, slight, medium, and serious fluorosis. It demonstrated a 15-19 point decrease in IQ among children in the fluorosis area as compared with the non-fluorosis area.²¹⁹ Another study of children's intelligence and the metabolism of iodine and fluorine, also in China, revealed that exposure to high levels of fluoride produced increased prevalence of thyroid enlargement (29.8%) and dental fluorosis (72.9%), and a slightly lower average IQ as compared to control areas. The IQ differential was more pronounced (16.8%) when lower intelligence children were studied separately.²²⁰ Paul Connett cites a recent review by the Greater Boston Physicians for Social Responsibility which found that fluoride interferes with brain function in young animals and children.²²¹

A more recent Chinese study found that chronic exposure to even moderate concentrations of fluoride in water had a marked negative impact on children's IQ, especially limiting the possibility of their developing "excellent" intelligence (IQ above 130) once fluoride levels exceeded 1.60 mg/L. There was also a correlation between severity of dental fluorosis and IQ level²²², a relationship which also emerged in a 2015 study of Indian children in Lucknow.²²³

Researchers from York University found a strong correlation between water fluoridation and Attention Deficit Hyperactivity Disorder (ADHD) diagnosis in a 2015 study. These results are unsurprising given the substance's negative effects on attention, memory and overall cognitive development; the 2015 study replicated the results of a 1995 rat study that demonstrated ADHD-like symptoms in fluoride-exposed subjects.²²⁴

In 2012, a Harvard team analyzed 27 studies investigating the effects of fluoride exposure on cognitive development in children and determined that further research should be a priority. Some studies suggested detrimental cognitive effects at concentrations as low as .15mg/L, particularly in children with coexisting iodine deficiency. It is a testament to the strength of the scientific orthodoxy concerning water fluoridation that even the alarming results of Harvard's meta-analysis, which solidified the cause-effect relationship between fluoride exposure and cognitive impairment, were framed as merely a "high priority" for further research instead of "national health emergency."²²⁵ Many of the studies chosen for the meta-analysis were conducted in China, which does not fluoridate its water but does contain naturally fluoridated areas of water, meaning the taboo against public discussion of fluoride's harmful effects is not a factor in addressing the health ramifications of these effects and Chinese scientists may have a freer hand to publish their findings on the topic.

In a 2014 paper published in the Lancet, Harvard University researcher Philippe Grandjean added six industrial chemicals, including fluoride, to a list of developmental neurotoxicants especially harmful to the developing brain. In what was perhaps a subtle nod to the American scientific academy's slavish devotion to pro-fluoride dogma, he called for the formation of an international clearinghouse to coordinate research into the neurotoxicants and their role in the rising prevalence of neurodevelopmental disabilities worldwide.²²⁶

Enzyme Toxicity and Genetic Damage

Fluoride is a potent enzyme poison. Enzymes are special types of proteins, known as catalysts, which trigger thousands of chemical reactions in the body. Enzymes are vital to our very existence, writes Dr. Anthony Cichoke: "During every moment of our lives, enzymes keep us going. At this very instant, millions of tiny enzymes are working throughout your body causing reactions to take place. You couldn't breathe, hold or turn the pages of this book, read its words, eat a meal, taste the food, or hear a telephone ring without enzymes. Even minute doses of 1 ppm of fluoride could prevent essential biological reactions from taking place."²²⁷

While the mechanisms of enzyme destruction were not well understood in the 1940's and 50's, scientists now believe that it could be due to

fluoride's interference with magnesium, a vital cofactor needed by many enzymes to perform catalytic functions. Another reason could be fluoride's ability to form strong bonds with hydrogen. Hydrogen, a strongly positive element, binds easily with the strong negatively-charged fluoride. Dr. Paul Connert explains: "Hydrogen bonding is at the very heart and soul of biochemistry. Protein structure and function revolve around hydrogen bonds. Hydrogen gives shape, and that shape can be easily manipulated with little energy. Enzymes usually catalyze around hydrogen bonds. In addition, the two strands of DNA are held together with hydrogen bonds. So, you're striking at the very heart of biology. It's a huge red flag to be extremely careful about introducing fluoride to any living system."²²⁸

While critics argue that only high doses cause such effects, studies suggest that even a supposedly "safe" concentration of 1 ppm of fluoride added to drinking water is able to interfere with critical biological functions. This was demonstrated in 1977 at Austria's Siebersdorf Research Center by Dr. W. Klein and colleagues, who found that even this low dose inhibited DNA repair enzyme activity by 50 percent and caused genetic and chromosome damage.²²⁹ A similar study conducted at the University of Missouri confirmed these results.²³⁰

Scientists at Poland's Pomeranian Medical Academy found that as little as 0.6 ppm of fluoride produced chromosomal damage to human white blood cells.²³¹ And most recently, in January of 2008, after 3 years of investigating hundreds of studies, an NRC expert panel "concluded that fluoride can subtly alter endocrine function, especially in the thyroid – the gland that produces hormones regulation growth and metabolism".²³²

The National Research Council's 2006 report summarized recent findings regarding fluoride's impairment of glucose metabolism even at low concentrations (.1mg/L), finding impaired glucose tolerance and increases in blood glucose and increasing the severity of diabetes - an effect compounded by diabetics' higher-than-normal water intake.²³³ Fluoride has been shown to inhibit insulin secretion, promoting hyperglycemia, and decrease insulin sensitivity.²³⁴ A Chinese study also found high rates of glucose intolerance and diabetes among inhabitants of a high-fluoride area.²³⁵

Sperm cells displayed "a highly significant increase in mutation" after being treated with fluoride at Holland's Leiden University.²³⁶ And studies at Germany's Central Laboratory for Mutagenicity Testing²³⁷ and by Drs. Yiamouyannis and Burk at Columbia University²³⁸ showed that it also caused genetic damage to eggs in both insects and laboratory animals. A 2017 study of in utero fluoride exposure showed that the rate of mental development in infants was inversely associated with fluoride exposure during the first and second trimesters, suggesting fluoride's detrimental effects on cognition could begin in the early prenatal stages of life.²³⁹ A similar study tracked the cognitive outcomes of Mexican children who had been exposed to fluoride in utero, assessing the children at age 4 and again at age 6-12. Prenatal fluoride exposure was indicative of lower cognitive test scores even 12 years into the child's life.²⁴⁰

MAFIA TACTICS AND COVERUPS

Given all the scientific challenges to the idea of the safety of fluoride, why does it remain a protected contaminant? As Susan Pare of the Center for Health Action asks, "...even if fluoride in the water did reduce tooth decay, which it does not, how can the EPA allow a substance more toxic than Alar, red dye #3, and vinyl chloride to be injected purposely into drinking water?"²⁴¹

This is certainly a logical question and, with all the significant, solid science that exists on the subject, you would think that there would be a great deal of interest in getting fluoride out of our water supply. Unfortunately, that hasn't been the case. As Dr. William Marcus, a senior science advisor in the EPA's Office of Drinking Water, has found, the top governmental priority has been to sweep the facts under the rug and, if need be, to suppress truth-tellers. Marcus explains that fluoride is one of the chemicals the EPA specifically regulates, and that he was following the data coming in on fluoride very carefully when a determination was going to be made on whether the levels should be changed. He discovered that the data were not being heeded. But that was only the beginning of the story for him. Marcus recounts what happened:

"The studies that were done by Botel Northwest showed that there was an increased level of bone cancer and other types of cancer in animals....in that same study, there were very rare liver cancers, according to the board-certified veterinary pathologists at the contractor, Botel. Those really were very upsetting because they were hepatocholangial carcinomas, very rare liver cancers....Then there were several other kinds of cancers that were found in the jaw and other places.

I felt at that time that the reports were alarming. They showed that the levels of fluoride that can cause cancers in animals are actually lower than those levels ingested in people (who take lower amounts but for longer periods of time).

I went to a meeting that was held in Research Triangle Park, in April 1990, in which the National Toxicology Program was presenting their review of the study. I went with several colleagues of mine, one of whom was a board-certified veterinary pathologist who originally reported hepatocholangial carcinoma as a separate entity in rats and mice. I asked him if he would look at the slides to see if that really was a tumor or if the pathologists at Botel had made an error. He told me after looking at the slides that, in fact, it was correct.

At the meeting, every one of the cancers reported by the contractor had been downgraded by the National Toxicology Program. I have been in the toxicology business looking at studies of this nature for nearly 25 years and I have never before seen every single cancer endpoint downgraded.... I found that very suspicious and went to see an investigator in the Congress at the suggestion of my friend, Bob Carton. This gentleman and his staff investigated very thoroughly and found out that the scientists at the National Toxicology Program down at Research Triangle Park had been coerced by their superiors to change their findings."²⁴²

Once Dr. Marcus acted on his findings, something ominous started to happen in his life:

"...I wrote an internal memorandum and gave it to my supervisors. I waited for a month without hearing anything. Usually, you get a feedback in a week or so. I wrote another memorandum to a person who was my second-line supervisor explaining that if there was even a slight chance of increased cancer in the general population, since 140 million people were potentially ingesting this material, that the deaths could be in the many thousands. Then I gave a copy of the memorandum to the Fluoride Work Group, who waited some time and then released it to the press.

Once it got into the press all sorts of things started happening at EPA -- I was getting disciplinary threats, being isolated, and all kinds of things which ultimately resulted in them firing me on March 15, 1992."²⁴³

In order to be reinstated at work, Dr. Marcus took his case to court. In the process, he learned that the government had engaged in various illegal activities, including 70 felony counts, in order to get him fired. At the same time, those who committed perjury were not held accountable for it. In fact, they were rewarded for their efforts:

When we finally got the EPA to the courtroom...they admitted to doing several things to get me fired. We had notes of a meeting...that showed that fluoride was one of the main topics discussed and that it was agreed that they would fire me with the help of the Inspector General. When we got them on the stand and showed them the memoranda, they finally remembered and said, oh yes, we lied about that in our previous statements.

Then...they admitted to shredding more than 70 documents that they had in hand - Freedom of Information requests. That's a felony.... In addition, they charged me with stealing time from the government. They...tried to show...that I had been doing private work on government time and getting paid for it. When we came to court, I was able to show that the time cards they produced were forged, and forged by the Inspector General's staff..."²⁴⁴

For all his efforts, Dr. Marcus was rehired, but nothing else has changed: "The EPA was ordered to rehire me, which they did. They were given a whole series of requirements to be met, such as paying me my back pay, restoring my leave, privileges, and sick leave and annual leave. The only thing they've done is put me back to work. They haven't given me any of those things that they were required to do."²⁴⁵

What is at the core of such ruthless tactics? John Yiamouyiannis feels that the central concern of government is to protect industry, and that the motivating force behind fluoride use is the need of certain businesses to dump their toxic waste products somewhere. They try to be inconspicuous in the disposal process and not make waves. "As is normal, the solution to pollution is dilution. You poison everyone a

little bit rather than poison a few people a lot. This way, people don't know what's going on."²⁴⁶ Since the Public Health Service has promoted the fluoride myth for over 50 years, they're concerned about protecting their reputation. So scientists like Dr. Marcus, who know about the dangers, are intimidated into keeping silent. Otherwise, they jeopardize their careers.

Dr. John Lee elaborates: "Back in 1943, the PHS staked their professional careers on the benefits and safety of fluoride. It has since become bureaucratized. Any public health official who criticizes fluoride, or even hints that perhaps it was an unwise decision, is at risk of losing his career entirely. This has happened time and time again. Public health officials such as Dr. Gray in British Columbia and Dr. Colquhoun in New Zealand found no benefit from fluoridation. When they reported these results, they immediately lost their careers.... This is what happens - the public health officials who speak out against fluoride are at great risk of losing their careers on the spot."²⁴⁷

Yiamouyiannis adds that for the authorities to admit that they're wrong would be devastating. "It would show that their reputations really don't mean that much.... They don't have the scientific background. As Ralph Nader once said, if they admit they're wrong on fluoridation, people would ask, and legitimately so, what else have they not told us right?"²⁴⁸

Accompanying a loss in status would be a tremendous loss in revenue. Yiamouyiannis points out that "the indiscriminate careless handling of fluoride has a lot of companies, such as Exxon, U.S. Steel, and Alcoa, making tens of billions of dollars in extra profits at our expense.... For them to go ahead now and admit that this is bad, this presents a problem, a threat, would mean tens of billions of dollars in lost profit because they would have to handle fluoride properly. Fluoride is present in everything from phosphate fertilizers to cracking agents for the petroleum industry."²⁴⁹

Fluoride could only be legally disposed of at a great cost to industry. As Dr. Bill Marcus explains, "There are prescribed methods for disposal and they're very expensive. Fluoride is a very potent poison. It's a registered pesticide, used for killing rats or mice.... If it were to be disposed of, it would require a class-one landfill. That would cost the people who are producing aluminum or fertilizer about \$7000+ per 5000- to 6000-gallon truckload to dispose of it. It's highly corrosive."²⁵⁰

Another problem is that the U.S. judicial system, even when convinced of the dangers, is powerless to change policy. Yiamouyiannis tells of his involvement in court cases in Pennsylvania and Texas in which, while the judges were convinced that fluoride was a health hazard, they did not have the jurisdiction to grant relief from fluoridation. That would have to be done, it was ultimately found, through the legislative process.²⁵¹

Dr. Hirzy, vice president of the union that represents the scientists who work for the EPA, cites three landmark cases in which judges with "no interest except in the finding of fact and administering justice"²⁵² ruled against fluoridation. In November, 1978, Judge John Flaherty, now Chief Justice of the Supreme Court of Pennsylvania, issued findings in the case, *Aitkenhead v. Borough of West View*, tried before him in the Allegheny Court of Common Pleas.

He summarized his findings as follows.

"In my view, the evidence is quite convincing that the addition of sodium fluoride to the public water supply at one part per million is extremely deleterious to the human body, and, a review of the evidence will disclose that there was no convincing evidence to the contrary..."²⁵³

"Prior to hearing this case, I gave the matter of fluoridation little, if any, thought, but I received quite an education, and noted that the proponents of fluoridation do nothing more than try to impugn the objectivity of those who oppose fluoridation."²⁵⁴

In an Illinois decision, Judge Ronald Niemann concludes: "This record is barren of any credible and reputable scientific epidemiological studies and or analysis of statistical data which would support the Illinois Legislature's determination that fluoridation of the water supplies is both a safe and effective means of promoting public health."²⁵⁵

Judge Anthony Farris in Texas found: "[That] the artificial fluoridation of public water supplies, such as contemplated by {Houston} City ordinance No. 80-2530 may cause or contribute to the cause of cancer, genetic damage, intolerant reactions, and chronic toxicity, including dental mottling, in man; that the said artificial fluoridation may aggravate malnutrition and existing illness in man; and that the value of said artificial fluoridation is in some doubt as to reduction of tooth decay in man."

Dr. Hirzy, himself a toxicologist and an expert in environmental management and risk assessment, comments: "The significance of Judge Flaherty's statement and his and the other two judges' findings of fact is this: proponents of fluoridation are fond of reciting endorsement statements by authorities, such as those by CDC and the American Dental Association, both of which have long-standing commitments that are hard if not impossible to recant, on the safety and efficacy of fluoridation. Now come three truly independent servants of justice, the judges in these three cases, and they find that fluoridation of water supplies is not justified."²⁵⁶

Interestingly, the judiciary seems to have more power to effect change in other countries. Yiamouyiannis states that when he presented the same technical evidence in Scotland, the Scottish court outlawed fluoridation based on the evidence.²⁵⁷

Indeed, most of Western Europe has rejected fluoridation on the grounds that it is unsafe. In 1971, after 11 years of testing, Sweden's Nobel Medical Institute recommended against fluoridation, and the process was banned. The Netherlands outlawed the practice in 1976, after 23 years of tests. IN 2003, Basel, Switzerland voted to end fluoridation after 41 years as the only Swiss city to engage in the practice. France decided against it after consulting with its Pasteur Institute²⁵⁸ and Germany rejected the practice because the recommended dosage of 1 ppm was "too close to the dose at which long-term damage to the human body is to be expected."²⁵⁹ Dr. Lee sums it up: "All of western Europe, except one or two test towns in Spain, has abandoned fluoride as a public health plan. It is not put in the water anywhere. They all established test cities and found that the benefits did not occur and the toxicity was evident."²⁶⁰ Ireland, one of the few European countries to adopt fluoridation nationwide, has been rejecting the procedure county by county since 2015, and in July 2018, Donegal County Councillors called on water provider Irish Water to end the practice and explore alternative means of treating the country's water.²⁶¹ Even some US municipalities have taken an enlightened stance on the issue, including Natick, MA, which opted to reject fluoridation in 1997 in the face of overwhelming evidence against the procedure.²⁶²

The Fluoride Action Network lists over 240 municipalities in the US and Canada that have rejected or discontinued fluoride since 2010, including Calgary, Alberta; Windsor, Ontario; Wichita, Kansas; and Bucks County, Pennsylvania.²⁶³ Eleven EPA unions, representing more than 7000 public health and environmental professionals, have called for an end to water fluoridation. More than 4700 medical professionals have signed Fluoride Action Network's Professionals Statement to End Water Fluoridation since 2007, releasing the statement to call attention to the historic National Research Council report released in 2006 that illuminated the myriad health effects associated with fluoride.

Isn't it time the United States as a whole followed this example? While the answer is obvious, it is also apparent that government policy is unlikely to change without public support. We therefore must communicate with legislators, and insist on the preservation of one of our most precious resources - pure, unadulterated drinking water. Yiamouyiannis urges all American people to do so. He emphasizes the immediacy of the problem:

"There is no question with regard to fluoridation of public water supplies. It is absolutely unsafe...and should be stopped immediately. This is causing more destruction to human health than any other single substance added purposely or inadvertently to the water supply. We're talking about 35,000 excess deaths a year...10,000 cancer deaths a year...130 million people who are being chronically poisoned. We're not talking about dropping dead after drinking a glass of fluoridated water.... It takes its toll on human health and life, glass after glass."²⁶⁴

Dr. Hirzy points to the absurdity of government policy on fluoride. The phosphate fertilizer industry captures hydrofluosilicic acid and uses what would otherwise be an air or water pollutant as a low-cost source of fluoride for water authorities. 'If this material comes out of a smoke stack it's an air pollutant; if it goes out the drain pipe into the river it's a water pollutant. But it is magically converted into some sort of

beneficial agent when put in a tank wagon and bled into the drinking water. It's a remarkable transformation."²⁶⁵ There is a major moral issue in the fluoridation debate that has largely escaped notice. The first is that, as columnist James Kilpatrick observes, it is "the right of each person to control the drugs he or she takes." Kilpatrick calls fluoridation compulsory mass medication, a procedure that violates the principles of medical ethics.²⁶⁶ A New York Times editorial agrees: "In light of the uncertainty, critics [of fluoridation] argue that administrative bodies are unjustified in imposing fluoridation on communities without obtaining public consent.... The real issue here is not just the scientific debate. The question is whether any establishment has the right to decide that benefits outweigh risks and impose involuntary medication on an entire population. In the case of fluoridation, the dental establishment has made opposition to fluoridation seem intellectually disreputable. Some people regard that as tyranny."²⁶⁸ The principle of informed consent requires that a patient be told of the associated risks before receiving medical treatment. This process is wholly absent where water fluoridation is concerned - indeed, the medical establishment goes out of its way to censor those who would tell the public the truth about the negative effects of fluoride, even resorting to character assassination when mere mockery is ineffective. The time to act is now. We have a responsibility to stand up against political influence and corruption, and do what is really best for us, our health, and the planet. The issue is no longer whether there is adequate science to make us question fluoride's safety. There is more than enough scientific evidence to support a total ban on fluoride. But industry and the our legislative bodies that are dominated by special interest groups may never get around to admitting the obvious danger, unless we demand it. The official stance on the fluoride issue reflects a consistent pattern of denial that begins in the earliest years of the twentieth century, with industry's initial support and encouragement for water fluoridation and continues to this day with propaganda campaigns, scientific disinformation, and out and out attacks on those who have attempted to let the truth be known. Whenever scientific orthodoxy maintains such a chokehold on the public discourse, it must be questioned. Americans have come around to the dangers of hundreds of toxic chemicals over the last century - leaded gasoline, PCBs, DDT and other pesticides, BPA, CFCs, and so on. We are capable of learning from our mistakes, but we must continue to oppose the entrenched interests that benefit from the toxic status quo. We must speak out now, and let our leaders know that we want the truth to come out. If not for us, for future generations to have the choice, the option, the opportunity (after all, are we not a country that rallies behind freedom?) to drink water -- the liquid of life -- without risking their vitality.

ENDNOTES (INTRO)

1 National Research Council. *Fluoride in Drinking Water: A Scientific Review of EPA's Standards*. Washington, DC: National Academies Press, 2006.

2 US Department of Health and Human Services Federal Panel on Community Water Fluoridation. "US Public Health Service Recommendation for Fluoride Concentration in Drinking Water for the Prevention of Dental Caries." Public Health Reports Jul-Aug 2015 Vol.130 accessed at: http://www.ada.org/~media/EBD/Files/PHS_2015_Fluoride_Guidelines.pdf?la=en

3 Mundy, W. et al. "Building a Database of Developmental Neurotoxicants: Evidence from Human and Animal Studies." United States Environmental Protection Agency. Presented at Society of Toxicology Annual Meeting, Baltimore MD, Mar 15-19 2009. http://www.fluoridealert.org/wp-content/uploads/epa_mundy.pdf

4 Connett, Paul. "Fluoride and the Brain: An Interview with Phyllis Mullenix." Fluoride Action Network. 2000. accessed at: <https://fluoridealert.org/content/mullenix-interview/>

5 Grandjean, P and PJ Landrigan. "Neurobehavioral effects of developmental toxicity." *Lancet Neurol.* 2014 Mar;13(3):330-8. accessed at: <https://www.ncbi.nlm.nih.gov/pubmed/24556010>

6 Beltrán-Aguilar, Eugenio D. and others. "Prevalence and Severity of Dental Fluorosis in the United States, 1999-2004." NCHS Data Brief No. 53, November 2010. accessed at: <https://www.cdc.gov/nchs/products/databriefs/db53.htm>

7 Wiener, RC et al. "Dental Fluorosis over Time: A comparison of National Health and Nutrition Examination Survey data from 2001-2002 and 2011-2012." *J Dent Hyg.* 2018 Feb;92(1):23-29. <https://www.ncbi.nlm.nih.gov/pubmed/29500282>

8 Yu, X and others. "Threshold effects of moderately excessive fluoride exposure on children's health: A potential association between dental fluorosis and loss of excellent intelligence." *Environ Int.* 2018 Sep; 118:116-124. doi: 10.1016/j.envint.2018.05.042. Epub 2018 Jun 2. accessed at: <https://www.ncbi.nlm.nih.gov/pubmed/29870912>

9 Bashash, Morteza et al. "Prenatal Fluoride Exposure and Cognitive Outcomes in Children at 4 and 6-12 Years of Age in Mexico." *Environ Health Perspect.* September 2017. 125(9). <https://ehp.niehs.nih.gov/ehp655/#tab1>

10 Li, Jin et al. "Effects of High Fluoride Level on Neonatal Neurobehavioral Development." *Chinese Journal of Endemiology.* 2004 Sep;23(5):463-5. accessed at: <http://cof-cof.ca/wp-content/uploads/2015/11/Li-Yao-Shao-and-Wu-Effects-Of-High-Fluoride-Level-On-Neonatal-Neurobehavioral-Development-Chinese-Journal-of-Endemiology-2004.pdf>

11 Niu, R et al. "Effects of fluoride on synapse morphology and myelin damage in mouse hippocampus." *Chemosphere.* 2018 Mar;194:628-633. doi: 10.1016/j.chemosphere.2017.12.027. Epub 2017 Dec 6. <https://www.ncbi.nlm.nih.gov/pubmed/29241138>

12 Niu Q et al. "Excessive ER stress and the resulting autophagic flux dysfunction contribute to fluoride-induced neurotoxicity." *Environ Pollut.* 2018 Feb;233:889-899. <https://www.ncbi.nlm.nih.gov/pubmed/29100748>

13 Jiang, S et al. "Fluoride and arsenic exposure impairs learning and memory and decreases mGluR5 expression in the hippocampus and cortex of rats." *PLoS One.* 2014 Apr 23;9(4):e96041. <https://www.ncbi.nlm.nih.gov/pubmed/24759735>

14 Baros, M et al. "Alterations in the memory of rat offspring exposed to low levels of fluoride during gestation and lactation: Involvement of the $\alpha 7$ nicotinic receptor and oxidative stress." *Reprod Toxicol.* 2018 Jul 28;81:108-114. doi: 10.1016/j.reprotox.2018.07.078. <https://www.ncbi.nlm.nih.gov/pubmed/30009953>

15 Dec, K et al. The Influence of Fluorine on the disturbances of Homeostasis in the Central Nervous System. *Biol Trace Elem Res.* 2017 Jun;177(2):224-234. doi: 10.1007/s12011-016-0871-4. Epub 2016 Oct 27. <https://www.ncbi.nlm.nih.gov/pubmed/27787813>

16 Choi, AL. "Developmental fluoride neurotoxicity: a systematic review and meta-analysis." *Environ Health Perspect.* 2012 Oct;120(10):1362-8. doi: 10.1289/ehp.1104912. Epub 2012 Jul 20. <https://www.ncbi.nlm.nih.gov/pubmed/22820538>

17 Choi, Anna L. et al. "Association of lifetime exposure to fluoride and cognitive functions in Chinese children: A pilot study." *Neurotoxicol Teratol.* 2015 Jan-Feb;47:96-101. doi: 10.1016/j.ntt.2014.11.001. Epub 2014 Nov 8. <https://www.ncbi.nlm.nih.gov/pubmed/25446012>

18 Malin, Ashley J. and Christine Till. Exposure to fluoridated water and attention deficit hyperactivity disorder prevalence among children and adolescents in the United States: an ecological association. *Environmental Health.* 2015; 14:17. accessed at: <https://ehjournal.biomedcentral.com/articles/10.1186/s12940-015-0003-1>

- 19 Basha, PM et al. "Fluoride toxicity and status of serum thyroid hormones, brain histopathology, and learning memory in rats: a multigenerational assessment." *Biol Trace Elem Res*. 2011 Dec;144(1-3):1083-94. <https://link.springer.com/article/10.1007%2Fs12011-011-9137-3>
- 20 Cui, YS. "Effects of fluoride exposure on thyroid hormone level and intelligence in rats." *Zhonghua Lao Dong Wei Sheng Zhi Ye Bing Za Zhi*. 2017 Dec 20;35(12):888-892. doi: 10.3760/cma.j.issn.1001-9391.2017.12.002. <https://www.ncbi.nlm.nih.gov/pubmed/29495148>
- 21 Bergman, Ake et al. State of the Science of Endocrine Disrupting Chemicals - 2012. World Health Organization and United Nations Environmental Programme, 2013. accessed at: http://apps.who.int/iris/bitstream/10665/78101/1/9789241505031_eng.pdf
- 22 Vandenberg, Laura N. et al. "Hormones and Endocrine-Disrupting Chemicals: Low-Dose Effects and Nonmonotonic Dose Responses." *Endocrine Reviews*, June 2012, 33(3): 378-455. doi:10.1210/er.2011-1050. accessed at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3365860/>
- 23 Chaitanya, NCSK and others. "A systematic analysis on possibility of water fluoridation causing hypothyroidism." *Indian J Dent Res*. 2018 May-Jun;29(3):358-363. doi: 10.4103/ijdr.iJDR_505_16. accessed at: <https://www.ncbi.nlm.nih.gov/pubmed/29900922>
- 24 Kheradpisheh, Z et al. "Impact of Drinking Water Fluoride on Human Thyroid Hormones: A Case-Control Study." *Sci Rep*. 2018 Feb 8;8(1):2674. <https://www.ncbi.nlm.nih.gov/pubmed/29422493>
- 25 Peckham, S. et al. "Are fluoride levels in drinking water associated with hypothyroidism prevalence in England? A large observational study of GP practice data and fluoride levels in drinking water." *Journal of Epidemiology and Community Health*. 2015, July. 69(7):619-24. <https://www.ncbi.nlm.nih.gov/pubmed/25714098>
- 26 Fluegge, K. "Community water fluoridation predicts increase in age-adjusted incidence and prevalence of diabetes in 22 states from 2005 and 2010." *J Water Health*. 2016 Oct; 14(5):864-877. <https://www.ncbi.nlm.nih.gov/pubmed/27740551>
- 27 Liang S. Sodium fluoride exposure exerts toxic effects on porcine oocyte maturation. *Sci Rep*. 2017 Dec 6;7(1):17082. <https://www.ncbi.nlm.nih.gov/pubmed/29213094>
- 28 Liang, S. "Fluoride impairs oocyte maturation and subsequent embryonic development in mice." *Environmental Toxicology*. November 2016. 31(11):1486-1495. <https://onlinelibrary.wiley.com/doi/abs/10.1002/tox.22153>
- 29 Zhou, Yongjiang et al. "Effects of sodium fluoride on reproductive function in female rats." *Food and Chemical Toxicology*. June 2013, 56:297-303. <https://www.sciencedirect.com/science/article/pii/S027869151300135X>
- 30 Grossman, Daniel et al. "The Effect of an Increase in Lead in the Water System on Fertility and Birth Outcomes: The Case of Flint, Michigan." 2017 August 7. <http://www2.ku.edu/~kuwpaper/2017Papers/201703.pdf>
- 31 Zhang, S. et al. "Fluoride-elicited developmental testicular toxicity in rats: roles of endoplasmic reticulum stress and inflammatory response." *Toxicol Appl Pharmacol*. 2013 Sep 1;271(2):206-15. doi: 10.1016/j.taap.2013.04.033. Epub 2013 May 22. <https://www.ncbi.nlm.nih.gov/pubmed/23707774>
- 32 Ribeiro, DA et al. "Fluoride Induces Apoptosis in Mammalian Cells: In Vitro and In Vivo Studies." *Anticancer Res*. 2017 Sep;37(9):4767-4777. <https://www.ncbi.nlm.nih.gov/pubmed/28870895>
- 33 Chouhan, S and SJ Flora. "Effects of fluoride on the tissue oxidative stress and apoptosis in rats: biochemical assays supported by IR spectroscopy data." *Toxicology*. 2008 Dec 5;254(1-2):61-7. doi: 10.1016/j.tox.2008.09.008. Epub 2008 Sep 18. <https://www.ncbi.nlm.nih.gov/pubmed/18845224>
- 34 Quadri, JA. "Fluoride induced tissue hypercalcemia, IL-17 mediated inflammation and apoptosis lead to cardiomyopathy: Ultrastructural and biochemical findings." *Toxicology*. 2018 May 22;406-407:44-57. doi: 10.1016/j.tox.2018.05.012. <https://www.ncbi.nlm.nih.gov/pubmed/29800585>
- 35 Agalakova, Natalia and Gennadii Gusev. "Fluoride-induced death of rat erythrocytes in vitro." *Toxicology in Vitro*. 2011 Dec;25(8):1609-1618. <https://www.sciencedirect.com/science/article/pii/S0887233311001743>
- 36 Strunicka, A. "Immunoexcitotoxicity as the central mechanism of etiopathology and treatment of autism spectrum disorders: A possible role of fluoride and aluminum." *Surg Neurol Int*. 2018 Apr 9;9:74. doi: 10.4103/sni.sni_407_17. accessed at: <https://www.ncbi.nlm.nih.gov/pubmed/29721353>
- 37 Sawan RM, et al. (2010). "Fluoride increases lead concentrations in whole blood and in calcified tissues from lead-exposed rats." *Toxicology* 271(1-2):21-6. <https://www.sciencedirect.com/science/article/pii/S0300483X10000351>
- 38 Maas, RP et al. "Effects of fluoridation and disinfection agent combinations on lead leaching from leaded-brass parts." *Neurotoxicology*. 2007 Sep;28(5):1023-31. Epub 2007 Jun 30. accessed at: <https://www.ncbi.nlm.nih.gov/pubmed/17697714>
- 39 Niu, R et al. "Decreased learning ability and low hippocampus glutamate in offspring rats exposed to fluoride and lead." *Environ Toxicol Pharmacol*. 2009 Sep;28(2):254-9. <https://www.ncbi.nlm.nih.gov/pubmed/21784012>
- 40 Gao, Qin et al. Decreased Learning and Memory Ability in Rats with Fluorosis: Increased Oxidative Stress and Reduced Cholinesterase Activity in the Brain. *Fluoride*. 2009 Oct-Dec; 42(4):277-285. https://www.fluorideresearch.org/424/424/files/FJ2009_v42_n4_p277-285.pdf
- 41 Yu, X and others. "Threshold effects of moderately excessive fluoride exposure on children's health: A potential association between dental fluorosis and loss of excellent intelligence." *Environ Int*. 2018 Sep; 118:116-124. doi: 10.1016/j.envint.2018.05.042. Epub 2018 Jun 2. accessed at: <https://www.ncbi.nlm.nih.gov/pubmed/29870912>
- 42 Ding Y et al. "The relationships between low levels of urine fluoride on children's intelligence, dental fluorosis in endemic fluorosis areas in Hulunbuir, Inner Mongolia, China." *J Hazard Mater*, 2011 Feb 28;186(2-3):1942-6. doi: 10.1016/j.jhazmat.2010.12.097. <https://www.ncbi.nlm.nih.gov/pubmed/21237562>
- 43 Masters, Roger D. "A Moratorium on Silicofluoride Usage Will Save \$Millions," Guest Editorial, *Fluoride*, 38 (2005), 1-5. accessed at: <https://oehha.ca.gov/media/downloads/proposition-65/crn/comments/rmasters.pdf>
- 44 Seavey, Jay. "Water Fluoridation and Crime in America." *Fluoride*. 2005;38(1):11-22. https://www.researchgate.net/publication/228694473_Water_fluoridation_and_crime_in_America
- 45 Hanna-Attisha, Mona et al. "Elevated Blood Lead Levels in Children Associated With the Flint Drinking Water Crisis: A Spatial Analysis of Risk and Public Health Response." *Am J Public Health*. 2016 February; 106(2): 283-290. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4985856/>

- 46 Rhoads, WJ et al. "Distribution System Operational Deficiencies Coincide with Reported Legionnaires' Disease Clusters in Flint, Michigan." *Environ Sci Technol*. 2017 Oct 17;51(20):11986-11995. doi: 10.1021/acs.est.7b01589. Epub 2017 Sep 26. <https://www.ncbi.nlm.nih.gov/pubmed/28849909>.
- 47 Pell, MB and Joshua Schneyer. "The thousands of US locales where lead poisoning is worse than in Flint." Reuters. 19 Dec 2016. <https://www.reuters.com/investigates/special-report/usa-lead-testing/>
- 48 Jain, A. et al. "Melatonin ameliorates fluoride induced neurotoxicity in young rats: an in vivo evidence." *Asian Journal of Pharmaceutical and Clinical Research*. 2015 Jul-Aug; 8(4):164-67. https://www.researchgate.net/publication/282281788_Melatonin_ameliorates_fluoride_induced_neurotoxicity_in_young_rats_An_In_Vivo_evidence
- 49 Atmaca, Nurgul et al. "Protective effect of resveratrol on sodium fluoride-induced oxidative stress, hepatotoxicity and neurotoxicity in rats." *Food and Chemical Toxicology*. 2014 Aug;70:191-197. <https://www.sciencedirect.com/science/article/pii/S0278691514002452>
- 50 Megrim, Nageshwar. "Quercetin treatment against NaF induced oxidative stress related neuronal and learning changes in developing rats." *Journal of King Saud University - Science*. 2017 Apr;29(2)221-229. <https://www.sciencedirect.com/science/article/pii/S1018364715300227>
- 51 Nabavi, Seyed M. et al. "In vivo protective effects of quercetin against sodium fluoride-induced oxidative stress in the hepatic tissue." *Food Chemistry*. 2012 May 15;132(2)931-935. <https://www.sciencedirect.com/science/article/pii/S0308814611016529>
- 52 Hassan, HA et al. "Evaluation of free radical-scavenging and anti-oxidant properties of black berry against fluoride toxicity in rats." *Food and Chemical Toxicology*. 2010 Aug-Sep;48(8-9):1999-2004. <https://www.sciencedirect.com/science/article/pii/S0278691510002942>
- 53 Nabavi, Seyed F. et al. "Cytoprotective effects of curcumin on sodium fluoride-induced intoxication in rat erythrocytes." *Bull Environ Contam Toxicol*. 2012 Mar;88(3):486-90. doi: 10.1007/s00128-011-0495-5. Epub 2011 Dec 6 <https://www.ncbi.nlm.nih.gov/pubmed/22143374>
- 54 Nabavi, Seyed F. et al. "Protective effects of curcumin against sodium fluoride-induced toxicity in rat kidneys." *Biol Trace Elem Res*. 2012 Mar;145(3):369-74. doi: 10.1007/s12011-011-9194-7. Epub 2011 Sep 7. <https://www.ncbi.nlm.nih.gov/pubmed/21901432>
- 55 Tiwari, H and Rao MV. "Curcumin supplementation protects from genotoxic effects of arsenic and fluoride." *Food Chem Toxicol*. 2010 May;48(5):1234-8. doi: 10.1016/j.fct.2010.02.015. Epub 2010 Feb 17. <https://www.ncbi.nlm.nih.gov/pubmed/20170701>
- 56 Sharma, C et al. "Curcumin and resveratrol rescue cortical-hippocampal system from chronic fluoride-induced neurodegeneration and enhance memory retrieval." *Int J Neurosci*. 2018 Apr 13:1-15. doi: 10.1080/00207454.2018.1458727. <https://www.ncbi.nlm.nih.gov/pubmed/29607689>
- 57 Abdelaleem MM et al. "Possible protective effect of curcumin on the thyroid gland changes induced by sodium fluoride in albino rats: light and electron microscopic study." *Endocr Regul*. 2018 Apr 1;52(2):59-68. doi: 10.2478/enr-2018-0007. <https://www.ncbi.nlm.nih.gov/pubmed/29715188>
- 58 Sharma, C. et al. "Curcumin attenuates neurotoxicity induced by fluoride: An in vivo evidence." *Pharmacogn Mag*. 2014 Jan;10(37):61-5. doi: 10.4103/0973-1296.126663. <https://www.ncbi.nlm.nih.gov/pubmed/24696547>
- 59 "Community Water Fluoridation Statistics." CDC. 8/19/16. Accessed at: <https://www.cdc.gov/fluoridation/statistics/2014stats.htm>

ENDNOTES (ARTICLE)

- 1 Dr. John Yiamouyiannis, in interview with Gary Null, 3/10/95. His statement is referenced in the *Clinical Toxicology of Commercial Products*, Fifth Ed., Williams and Wilkins.
- 2 Joel Griffiths, "Fluoride: Commie Plot or Capitalist Ploy," *Covert Action*, Fall 1992, Vol. 42, p. 30.
- 3 O'Shea, Tim. "Fluoride and Cancer", accessed from www.thedoctorwithin.com/articles/water.html.
- 4 Ibid., p. 27.
- 5 The Fluoride Story. National Institute of Dental Research.
- 6 Griffiths, p. 28.
- 7 Ibid.
- 8 Ibid.
- 9 Ibid.
- 10 Ibid.
- 11 Griffiths, op. cit.
- 12 "H. Trendley Dean." *MWWR Weekly*. October 22, 1999 / 48(41):935.
- 13 The Fluoride Story, National Institute of Dental Research
- 14 J. Colquhoun, Chief Dental Officer, NZ, International Symposium on Fluoridation, Porte Alegre, Brazil, September, 1988.
- 15 Proceedings, City of Orville Vs. Public Utilities Commission of the State of California, Orville, CA, October 20-21 (1955)
- 16 AMA Council Hearing, Chicago, August 7, 1957
- 17 McNeil, The Fight for Fluoridation, 1957, p. 37.
- 18 Griffiths, op. cit., p. 28.
- 19 G.L. Waldbott et al., *Fluoridation: The Great Dilemma*, Lawrence, KS, Coronado Press, 1978, p. 295.
- 20 Paul Farhi, *Washington Post*, 11/23/91.
- 21 Griffiths, op. cit., p. 63.
- 22 Ibid.
- 23 *Longevity Magazine*, pp. 7-89.
- 24 *The Morning Call*, 2/7/90
- 25 *Science*, 1/90.
- 26 Waldbott, op. cit., p. 255.
- 27 Letter, Rebecca Hammer, 3/83.
- 28 U.S. Dept. of Health and Human Services, "Policy statement on community water fluoridation," July 22, 1992, Washington, D.C.
- 29 "Community Water Fluoridation Statistics." CDC. 8/19/16. Accessed at: <https://www.cdc.gov/fluoridation/statistics/2014stats.htm>
- 30 British Fluoridation Society "One in a Million: the Facts About Water Fluoridation." November 2012. Accessed from: <https://res.cloudinary.com/berkey-water-filters-europe/image/upload/pdf/extent-worldwide-fluoridation.pdf>
- 31 *Los Angeles Times*. 1/ 26/95.
- 32 *The Chicago Tribune*, 1/26/95
- 33 A.S. Gray, *Canadian Dental Association Journal*, October 1987, pp. 76-83.
- 34 Letter, Sierra Club to Wm. K. Reilly, EPA, 7/21/89.
- 35 John Yiamouyiannis, *Fluoride*, 1990, Vol. 23, pp. 55-67.
- 36 J.A. Brunelle and J.P. Carlos, "Recent Trends in Dental Caries in U.S. Children and the Effect of Water Fluoridation," *Journal of Dental Research*, Vol. 69, Special Issue (February 1990), pgs. 723-727 and discussion pgs. 820-823.
- 37 *Center for Health Action*, 3/30/90.
- 38 *Clinical Pediatrics*, Nov. 1991.
- 39 *ADA News*, 10/17/94.
- 40 Angelillo IF, Torre I, Nobile CG, Villari P. Caries and fluorosis prevalence in communities with different concentrations of fluoride in the water. *Caries Res* 1999;33(2):114-22.
- 41 *The Science and Practice of Caries Prevention*. Featherstone, J.D.B. *Journal of the American Dental Association* 2001 131, 887-899.
- 42 Seppa L, Karkkainen S, Hausen H. Caries trends 1992-1998 in two low-fluoride Finnish towns formerly with and without fluoridation. *Caries Res* 2000 Nov-

Dec;34(6):462-8.

43 Maupome G, Clark DC, Levy SM, Berkowitz J. Patterns of dental caries following the cessation of water fluoridation. *Community Dent Oral Epidemiol* 2001 Feb;29(1):37-47

44 Kunzel W, Fischer T. Caries prevalence after cessation of water fluoridation in La Salud, Cuba. *Caries Res* 2000 Jan-Feb;34(1):20-5

45 de Liefde B. The decline of caries in New Zealand over the past 40 years. *N Z Dent J* 1998 Sep;94(417):109-13.

46 Kunzel W, Fischer T, Lorenz R, Bruhmann S. Decline of caries prevalence after the cessation of water fluoridation in the former East Germany. *Community Dent Oral Epidemiol* 2000 Oct;28(5):382-9

47 Kumar JV, Swango PA. *Community Dent Oral Epidemiol* 1999 Jun;27(3):171-80.

48 "Community Water Fluoridation and Caries Prevention: A Critical Review," *Clinical Oral Investigations*, by Giuseppe Pizzo & Maria R. Piscopo & Ignazio Pizzo & Giovanna Giuliana 2007 Feb 27. Accessed from: <http://www.newmediaexplorer.org/chris/Pizzo-2007.pdf>.

49 Müller, F. and others, "Elemental depth profiling of fluoridated hydroxyapatite: saving your dentition by the skin of your teeth?" *Langmuir*. 2010 Dec 21;26(24):18750-9. accessed from: <https://www.ncbi.nlm.nih.gov/pubmed/21090577>

50 *Chemical and Engineering News*, 8/1/88, p.31.

51 Limeback H. A re-examination of the pre-eruptive and post-eruptive mechanism of the anti-caries effects of fluoride: is there any anti-caries benefit from swallowing fluoride? *Community Dent Oral Epidemiol* 1999 Feb;27(1):62-71

52 Gary Null interview with Dr. Harvey Limeback, 1/30/01.

53 Gary Null interview.

54 Keith E. Heller and others, "Dental Caries and Dental Fluorosis at Varying Water Fluoride Concentrations," *Journal of Public Health and Dentistry*, Vol. 57, No. 3 (Summer 1997), pgs. 136-143.

55 Kumar, S. and others. "Dental fluorosis and associated risk factors in early adolescents in India." *Int J Adolesc Med Health*. 2018 Jul 5. pii: /j/ijamh.ahead-of-print/ijamh-2017-0200.xml. accessed from: <https://www.ncbi.nlm.nih.gov/pubmed/29975665>

56 British Fluoridation Society.

57 John Colquhoun. Why I Changed My Mind About Water Fluoridation. *Perspectives in Biology and Medicine*, 41, 1, Autumn 1997.

58 National Institutes of Health. News Release concerning Consensus statement regarding Diagnosis and Management of Dental Caries Throughout Life, March 26-28, 2001, Vol. 18, No. 1 accessed from: http://consensus.nih.gov/news/releases/115_release.htm.

59 Waldbott, op. cit., p. xvii.

60 CDC, 2000/2012.

62 Statement by Dr. James Patrick before Congressional Subcommittee, 8/4/82.

63 *Journal of the Canadian Dental Association*, Vol. 59, Apr. 1993, p. 334.

64 Gary Null interview with Dr. John Lee, 3/10/95.

65 Ibid.

66 Roholm K. Fluorine Intoxication. A Clinical-Hygienic Study. *Nyt Nordisk*, Copenhagen and H K Lewis, London 1937 pp 281-282.

67 Health Effects of Ingested Fluoride. National Academy of Sciences, USA 1993: p 59.

68 F. Exner and G. Waldbott, *The American fluoridation*

69 *Federal Register*, 12/24/75

70 See <http://www.fluoridealert.com/>

71 Pierre-M. Galletti and Gustave Joyet, "Effect of fluorine on thyroïdal iodine metabolism in hyperthyroidism," *Journal of Clinical Endocrinology*, Vol. 18 (October 1958), pgs. 1102-1110.

72 Chaitanya, NCSK and others. "A systematic analysis on possibility of water fluoridation causing hypothyroidism." *Indian J Dent Res*. 2018 May-Jun;29(3):358-363. doi: 10.4103/ijdr.ijdr_505_16. accessed at: <https://www.ncbi.nlm.nih.gov/pubmed/29900922>

73 *Merck Index*, 1960, p. 952; Waldbott, et al., 1978, p. 163.

74 Beth Ann Ditkoff and Paul Lo Gerfo, *THE THYROID GUIDE* [ISBN 0060952601] (New York: Harper, 2000), cover notes.

75 *HIP FRACTURES & FLUORIDE REVISITED: A CRITIQUE*. Fluoride Vol. 33 No. 1 1-5 2000 Editorial 1.

76 *Chemical and Engineering News*, 8/1/88, p. 33.

77 Jan G. Stannard et al., "Fluoride levels and fluoride contamination of fruit juices," *The Journal of Clinical Pediatric Dentistry*, Vol. 16, No. 1, 1991, pp. 38-40.

78 Gary Null interview.

79 Heilman, et al., *JADA*, July 1997.

80 Ibid.

81 Ibid.

82 Bardsen A, Bjorvatn K. Risk periods in the development of dental fluorosis. *Clin Oral Investig* 1998 Dec;2(4):155-60

83 Mascarenhas, Ana Karina. Risk factors for Dental Fluorosis: A review of the recent literature. *Pediatric Dentistry*, 4/22/2000.

84 Pereira AC, Da Cunha FL, Meneghim M de C, Werner CW. Dental caries and fluorosis prevalence study in a nonfluoridated Brazilian community: trend analysis and toothpaste association. *Fluoride* 33 (2) 2000.

85 Institute of Medicine (1997). *Dietary Reference Intakes for Calcium, Phosphorus, Magnesium, Vitamin D, and Fluoride*. Standing Committee on the Scientific Evaluation of Dietary Reference Intakes, Food and Nutrition Board. National Academy Press, Washington, DC. Cited in "50 Reasons to Oppose Fluoridation."

86 Ibid.

87 Rwenyonyi CM, Birkeland JM, Haugejorden O, Bjorvatn K. Age as a determinant of severity of dental fluorosis in children residing in areas with 0.5 and 2.5 mg fluoride per liter in drinking water. *Clin Oral Investig* 2000 Sep;4(3):157-61

88 Waldbott, op. cit., pp. 307-308.

89 Gary Null interview.

90 Gary Null interview with Dr. John Lee, 3/10/95.

91 *Schenectady Gazette Star*, 8/5/89.

92 *Community Dental Oral Epidemiology*, June 1994

92 Beltrán-Aguilar, Eugenio D. and others. "Prevalence and Severity of Dental Fluorosis in the United States, 1999-2004." *NCHS Data Brief No. 53*, November 2010. accessed at: <https://www.cdc.gov/nchs/products/databriefs/db53.htm>

93 Daniel Grossman, "Fluoride's Revenge," *The Progressive*, Dec. 1990, pp. 29-31

94 Trufanova, V. and others. "Characteristics of epidemiology of dental caries in children from regions with high and optimum fluoride content in drinking water." *Wiad Lek*. 2018;71(2 pt 2):335-338. accessed at: <https://www.ncbi.nlm.nih.gov/pubmed/29786582>

95 *American Journal of Public Health*, 12/85.

96 Gary Null interview with Dr. John Yiamouyiannis, 3/10/95.

97 Daniel Grossman. Op. cit..

98 George Glasser, "Dental Fluorosis - A Legal Time Bomb!" *Sarasota/Florida ECO Report*, Vol. 5, No. 2, Feb. 1995, pp. 1-5.

99 <http://www.cdc.gov/mmwr/preview/mmwrhtml/figures/s403a1t23.gif>

100 *New York Times*, Sunday, June 10, 2001.

101 *Chemical and Engineering News*, 8/1/88, p. 49.

102 *New York State Coalition Opposed to Fluoridation*, release, 11/89.

103 Gary Null interview with Dr. John Yiamouyiannis 4/28/90.

104 *Chemical and Engineering News*, 8/1/88, p. 36.

105 Hileman, Bette. Fluoridation of Water. Questions about Health Risks and Benefits Remain After 40 Years. *Chemical & Engineering News* Vol. 66 (August 1, 1988).

106 Connett P. 50 Reasons to Oppose Fluoridation.

107 Gary Null interview.

108 Waldbott, op. cit., p. 38.

109 F. Exner and G. Waldbott, op. cit., pp. 42-43.

110 *JAMA*, Vol. 264, July 25, 1990, pp. 500.

111 Cooper et al., *JAMA*, Vol. 266, July 24, 1991, pp. 513-14.

112 Christa Danielson et al., "Hip fractures and fluoridation in Utah's elderly population," *JAMA*, Vol. 268, Aug. 12, 1992, pp. 746-48.

113 Ibid., p. 746.

114 *New England Journal of Medicine*, Vol. 322, pp. 802-809.

115 *Journal of Bone and Mineral Research*, 11/94.

116 "Belgium Bans Gum, Tablets and Drops with Fluoride." *YaleGlobal*. 31 July 2002. accessed at: <https://yaleglobal.yale.edu/content/belgium-bans-gum-tablets-and-drops-fluoride>

117 U.S. National Research Council, *Diet and Health*, Washington, D.C., National Academy Press, 1989, p. 121.

118 Hip Fractures And Fluoride Revisited: A Critique. Fluoride Vol. 33 No. 1 1-5 2000 Editorial 1.

119 Ibid.

120 U.S. National Research Council, Diet and Health, Washington, D.C., National Academy Press, 1989, p. 121.

121 Waldbott GL, Burgstahler A, McKinney HL. Fluoridation: The Great Dilemma. Coronado Press Inc, Kansas, 1978. pp81-4.

122 50 reasons to oppose fluoridation.

123 National Cancer Institute (1989). Cancer Statistics Review, 1973-1987, Bethesda, MD: National Institutes of Health. Publication No.90-2789.

124 Cohn, P.D. (1992). An Epidemiologic Report on Drinking Water and Fluoridation. New Jersey Department of Health, Trenton, NJ.

125 Albright JA. The effect of fluoride on the mechanical properties of bone. Transactions of the Annual Meeting of the Orthopedics Research Society. 1978; 240 (15): 1630-1.

126 Robin JC, et al. Studies on osteoporosis III. Effect of estrogens and fluoride. J Med. 1980; II (1): 1-14

127 Danielson C, et al. Hip fractures and fluoridation in Utah's elderly. JAMA 1992; 268: 746-8.

128 Kleerekoper M. Fluoride and the skeleton. Crit Rev Clin Lab Sci 1996 Apr;33(2):139-61

129 Dequeker J, Declerck K. Schweiz Med Wochenschr 1993 Nov 27;123(47):2228-34 Fluor in the treatment of osteoporosis. An overview of thirty years clinical research.

130 L.R. Hedlund and J.C. Gallagher, "Increased incidence of hip fracture in osteoporotic women treated with sodium fluoride," Journal of Bone Mineral Research, Vol. 4, No. 2 (April 1989), pgs. 223-225.

131 B.L. Riggs and others, "Effect of fluoride treatment on the fracture rates in postmenopausal women with osteoporosis," New England Journal of Medicine, Vol. 322, No. 12 (March 22 1990), pgs. 802-809.

132 Kotha SP, Walsh WR, Pan Y, Guzelsu N. Varying the mechanical properties of bone tissue by changing the amount of its structurally effective bone mineral content. Biomed Mater Eng 1998;8(5-6):321-34

133 Colquhoun. Op. Cit.

134 See Connett P. 50 Reasons to Oppose Fluoridation.

135 Li, Y., C. Liang, et al. (1999). "Effect of Long-Term Exposure to Fluoride in Drinking Water on Risks of Bone Fractures." Journal of Bone and Mineral Research, Vol 16, No. 5, 2001.

136 Levy SM, et al. (2009). Associations of fluoride intake with children's bone measures at age 11. Community Dentistry and Oral Epidemiology 37(5):416-26. accessed at: <http://fluoridealert.org/studies/ifs/>

137 "Middletown, Maryland latest city to receive toxic spill of fluoride in their drinking water," report by Truth About Fluoride, Inc., in Townsend Letter for Doctors, 10/15/94, p. 1124.

138 "Middletown, Maryland latest city to receive toxic spill of fluoride in their drinking water," report by Truth About Fluoride, Inc., in Townsend Letter for Doctors, 10/15/94, p. 1124.

139 Reprinted by M. Bevis, "Morbidity associated with ingestion/dialysis of community water fluoride," CDC, Dental Div., 6/11/92, distributed by Safe Water Foundation of Texas.

140 Townsend Letter for Doctors, 10/94, p. 1125.

141 Janet Raloff, "The St. Regis Syndrome," Science News, July 19, 1980, pp. 42-43; reprinted in Griffiths, op. cit., p. 26.

142 Robert Tomalin, "Dumping grounds," Wall Street Journal, Nov. 29, 1990; reprinted in Griffiths, op. cit.

143 G.L. Waldbott et al., Fluoridation: The Great Dilemma, Lawrence, KS, Coronado Press, 1978, p. 222.

144 Ibid.

145 Graham, JR and Morin PJ. Highlights of North American Litigation During the Twentieth Century on Fluoridation of Public Water Supplies. Journal of Land Use and Environmental Law.

146 Ibid.

147 Hilleboe HE, et al. Newburgh-Kingston Caries Fluorine Study: Final Report, 52. JADA 290 (1956).

148 Harris RR. Dental Science in a New Age, History of the National institute of Dental Research (1989)

149 Ibid.

150 Graham and Morin. Op. Cit.

151 John Yiamouyiannis and Dean Burk, "Fluoridation of public water systems and cancer death rates in humans," presented at the 57th annual meeting of the American Society of Biological Chemists, and published in Fluoride, Vol. 10, No. 3, 1977, pp. 102-103.

152 National Institute of Dental Research, "Fluoridation of water and cancer: a review of the epidemiological efficiency," 1985, pp. 10-13.

153 New York State Coalition Opposed to Fluoridation.

154 Newsday, 2/27/90.

155 Oakland Tribune, 2/16/90.

156 NFFE Local 2050, 3/90.

157 Washington Post, 2/20/90.

158 The Lancet, 2/3/90.

159 Gary Null interview with Dr. John Yiamouyiannis 4/28/90.

160 Center for Health Action.

161 M.W. Browne, The New York Times, 3/13/90.

162 Ibid.

163 Medical Tribune, 2/22/90.

164 New York State Medical News, 3/90.

165 S. Begley, Newsweek, 2/5/90.

166 Safe Water Foundation, 3/4/90

167 Mutation Research, Vol. 223, pp. 191-203.

168 Joel Griffiths, Medical Tribune, 2/22/90.

169 Gary Null interview with Dr. John Yiamouyiannis, 3/10/95.

170 Environmental and Molecular Mutagenesis, Vol. 21, pp. 309-318.

171 Journal of Carcinogenesis, Vol. 9, pp. 2279-2284.

172 "Summary review of health effects associated with hydrogen fluoride acid related compounds," EPA Report Number 600/8-29/002F, Dec. 1988, pp. 1- .

173 Mark Lowey, "Scientists question health risks of fluoride," Calgary Herald, Calgary, Alberta, Canada, Feb. 28, 1992;

174 Griffiths, op. cit., p. 66.

175 June 6, 2005 letter from Richard Wiles, Sr. Vice President, Environmental Working Group to Dr. CW Jameson, National Toxicology Program, Report on Carcinogens accessed at: <http://www.ewg.org/issues/fluoride/20050606/petition.php>.

176 "Fluoride water 'causes cancer'," by Bob Woffinden, June 12, 2005, The Observer, accessed at: http://observer.guardian.co.uk/uk_news/story/0,6903,1504672,00.html.

177 "Association Between Fluoride in Drinking Water During Growth and Development and the Incidence of Osteosarcoma for Children and Adolescents," A Thesis Presented by Elise Beth Bassin, April 2001 <http://www.fluoridealert.org/health/cancer/bassin-2001.pdf>.

178 Bassin, EB et al "Age-specific fluoride exposure in drinking water and osteosarcoma (United States)." Cancer Causes Control. 2006 May; 17(4):421-8. accessed at <https://www.ncbi.nlm.nih.gov/pubmed/16596294>

179 Connett. 50 Reasons to Oppose Fluoridation.

180 Ibid.

181 Masters RD, Coplan MJ, Hone BT, Dykes JE. Association of silicofluoride treated water with elevated blood lead. Neurotoxicology 2000 Dec;21(6):1091-100

182 Trustees of Dartmouth College. Dartmouth Researcher Warns of Chemicals Added to Drinking Water. 15 March 2001. Accessed at: www.dartmouth.edu/~news.

183 Sawan RM, et al. (2010). "Fluoride increases lead concentrations in whole blood and in calcified tissues from lead-exposed rats." Toxicology 271(1-2):21-6. <https://www.sciencedirect.com/science/article/pii/S0300483X10000351>

184 Maas, RP et al. "Effects of fluoridation and disinfection agent combinations on lead leaching from leaded-brass parts." Neurotoxicology. 2007 Sep;28(5):1023-31. Epub 2007 Jun 30. accessed at: <https://www.ncbi.nlm.nih.gov/pubmed/17697714>

185 Yu, X and others. "Threshold effects of moderately excessive fluoride exposure on children's health: A potential association between dental fluorosis and loss of excellent intelligence." Environ Int. 2018 Sep; 118:116-124. doi: 10.1016/j.envint.2018.05.042. Epub 2018 Jun 2. accessed at: <https://www.ncbi.nlm.nih.gov/pubmed/29870912>

186 Leite GA, et al. (2011). Exposure to lead exacerbates dental fluorosis. Archives of Oral Biology 56(7):695-702.

187 Trustees of Dartmouth College. accessed at: https://www.researchgate.net/publication/49787639_Exposure_to_lead_exacerbates_dental_fluorosis

188 Ibid.

189 Ibid.

190 Masters, Roger D. "A Moratorium on Silicofluoride Usage Will Save \$Millions," Guest Editorial, Fluoride, 38 (2005), 1-5. accessed at: <https://oehha.ca.gov/media/downloads/proposition-65/crn/comments/rmasters.pdf>

- 191 Journal of Dental Research, Vol. 55, Sup B, p. 523, 1976, "Effect of Inorganic Fluoride Salts on Urine and Tissue Cyclic AMP Concentration in Vivo".
- 192 Finnegan, William. "Flint and the Long Struggle Against Lead Poisoning." *The New Yorker*, 4 February 2016. accessed at: <https://www.newyorker.com/news/daily-comment/flint-and-the-long-struggle-against-lead-poisoning>
- 193 Mullenix PJ, Denbesten PK, Schunior A, Kernan WJ. Neurotoxicity of sodium fluoride in rats. *Neurotoxicol Teratol* 1995 Mar-Apr;17(2):169-77
- 194 Ekambaram P, Paul V. Environ. Calcium preventing locomotor behavioral and dental toxicities of fluoride by decreasing serum fluoride level in rats. *Toxicol. Pharmacol.* 2001 Mar;9(4):141-146
- 195 Varner JA, Jensen KF, Horvath W, Isaacson RL. *Brain Res* 1998 Feb 16;784(1-2):284-98 Chronic administration of aluminum-fluoride or sodium-fluoride to rats in drinking water: alterations in neuronal and cerebrovascular integrity
- 196 Ibid.
- 197 Strunecka A, Patocka J. Reassessment of the role of aluminum in the development of Alzheimer's disease. *Cesk Fysiol* 1999 Feb;48(1):9-15
- 198 Gary Null interview with Paul Connett, Ph.D.
- 199 Strunecka A and Patocka J. Pharmacological and toxicological effects of aluminofluoride complexes. *Fluoride*, vol. 32, No. 4 (November 1999).
- 200 Ibid.
- 201 Luke JA. The Effect of Fluoride on the Physiology of the Pineal Gland.
- 202 Ibid.
- 203 National Sleep Foundation. Sleep in America poll. 2001.
- 204 Luboshitzky R, Lavie P. Melatonin and sex hormone interrelationships--a review. *J Pediatr Endocrinol Metab* 1999 May-Jun;12(3):355-62
- 205 Genazzani AR, Bernardi F, Monteleone P, Luisi S, Luisi M. Neuropeptides, neurotransmitters, neurosteroids, and the onset of puberty. *Ann N Y Acad Sci* 2000;900:1-9
- 206 Okasha M, McCarron P, McEwen J, Smith GD. Age at menarche: secular trends and association with adult anthropometric measures. *Ann Hum Biol* 2001 Jan-Feb;28(1):68-78
- 207 Adair LS, Gordon-Larsen P. Maturational timing and overweight prevalence in US adolescent girls. *Am J Public Health* 2001 Apr;91(4):642-4
- 208 Foulkes R. The Fluoride Connection: Fluoride and the Placental Barrier. *Townsend Letter for Doctors and Patients*. Issue #177.
- 209 Cox WR. Hello Test Animals or You and Your Grandchildren. Olsen Publishing Co., Milwaukee, WI 1951. Cited in Foulkes, op. cit.
- 210 Ibid.
- 211 Ibid.
- 212 Ibid.
- 213 Freni SC. Exposure to high fluoride concentrations in drinking water is associated with decreased birth rates. *J Toxicol Environ Health* 1994 May;42(1):109-21
- 214 Foulkes. Op. Cit.
- 215 Narayana MV and Chinoy NJ. Effects of fluoride on rat testicular steroidogenesis. *Fluoride*, 27; 1; 7-12, 1994.
- 216 Chinoy NJ, Narayana MV. In vitro fluoride toxicity in human spermatozoa. *Reprod Toxicol* 1994 Mar-Apr;8(2):155-9.
- 217 Ortiz-Pérez, Deogracias. "Fluoride-induced disruption of reproductive hormones in men." *Environmental Research*. September 2003. 93(1):20-30. accessed at: https://www.researchgate.net/publication/10659635_Fluoride-induced_disruption_of_reproductive_hormones_in_men
- 218 O'Shea, Tim. "Fluoride and Cancer (and other illnesses)." Accessed from www.thedoctorwithin.com/articles/water.html.
- 219 Li XS et al. Effect of fluoride exposure in intelligence in children. *Fluoride* 1995; 28 (4).
- 220 Yang Y, Wang X, Guo X. Effects of high iodine and high fluorine on children's intelligence and the metabolism of iodine and fluorine. *Zhonghua Liu Xing Bing Xue Za Zhi* 1994 Oct;15(5):296-8.
- 221 Shettler T, et al. In Harm's Way: Toxic Threats to Child Development. (Cambridge MA: Greater Boston Physicians for Social Responsibility, May 2000).
- 222 Yu, X and others. "Threshold effects of moderately excessive fluoride exposure on children's health: A potential association between dental fluorosis and loss of excellent intelligence." *Environ Int.* 2018 Sep; 118:116-124. doi: 10.1016/j.envint.2018.05.042. Epub 2018 Jun 2. accessed at: <https://www.ncbi.nlm.nih.gov/pubmed/29870912>
- 223 Khan, SA et al. "Relationship Between Dental Fluorosis and Intelligence Quotient of School Going Children in and Around Lucknow District: A Cross-Sectional Study." *J Clin Diagn Res.* 2015 Nov;9(11):ZC10-5. doi: 10.7860/JCDR/2015/15518.6726. Epub 2015 Nov 1. accessed at: <https://www.ncbi.nlm.nih.gov/pubmed/26673535>
- 224 Malin, Ashley J. and Christine Till. Exposure to fluoridated water and attention deficit hyperactivity disorder prevalence among children and adolescents in the United States: an ecological association. *Environmental Health*. 2015; 14:17. accessed at: <https://ehjournal.biomedcentral.com/articles/10.1186/s12940-015-0003-1>
- 225 "Fluoride & IQ: the 53 Studies." Fluoride Action Network. June 2018. accessed at: <http://fluoridealert.org/studies/brain01/>
- 226 Grandjean, P and PJ Landrigan. "Neurobehavioral effects of developmental toxicity." *Lancet Neurol.* 2014 Mar;13(3):330-8. accessed at: <https://www.ncbi.nlm.nih.gov/pubmed/24556010>
- 227 Gary Null interview.
- 228 Gary Null interview with Dr. Paul Connett, 1/30/01.
- 229 Klein W et al. DNA repair and environmental substances. *Zeitschrift fur Angewandte Bader-und Klimaheilkunde*, 1977; 24 (3).
- 230 Mohamed A, Chandler ME. Cytological effects of sodium fluoride on mice. *Fluoride*. 1982; 15 (3): 110-18.
- 231 Jachimczak D, Skotarczak B. The effect of fluorine and lead ions on the chromosomes of human leucocytes in vitro. *Genetica Polonica* . 1978; 19 (3): 353-7.
- 232 Scientific American article, by Dan Fagin, January 2008.
- 233 National Research Council. Fluoride in Drinking Water: A Scientific Review of EPA's Standards. Washington, DC: National Academies Press, 2006.
- 234 Garcia-Montalvo, EA, et al "Fluoride exposure impairs gluucose tolerance via decreased insulin expression and oxidative stress." *Toxicology*. 2009; 263:75-83. accessed at: https://www.researchgate.net/profile/Luz_Maria_Del_Razo/publication/264786589_Garcia-Montalvo_et_al_2009/links/53f0357d0cf26b9b7dcd67b.pdf?inViewer=true&pdfJsDownload=true&disableCoverPage=true&origin=publication_detail
- 235 Xie, Yong-ping et al. "Clinical Study of Effect of High Fluoride on the Function of the Pancreatic Islet B Cells." *Chinese Journal of Endemiology*. March 2000. 19:2:84-85. accessed at: <http://www.fluoridealert.org/uploads/xie-2000.pdf>
- 236 Mukerjee RN, Sobels FH. The effect of sodium fluoride and idoacetamide on mutation induction by X-irradiation in mature spermatozoa of drosophila.
- 237 Xie, Yong-ping et al. "Clinical Study of Effect of High Fluoride as potential mutagen in mammalian eggs. *Arch Environ Hlth* . 1974; 29: 230-5.
- 238 Yiamouyiannis JA, Burk D. Fluoridation of public water systems and the cancer death rate in humans. Presented at the 67th Annual Meeting of the American Society of Biologists and Chemists and the American Society of Experimental Biologists. June 1976.
- 239 Valdez Jiménez L et al. "In utero exposure to fluoride and cognitive development delay in infants." *Neurotoxicology*. 2017 Mar;59:65-70. doi:10.1016/j.neuro.2016.12.011. Epub 2017 Jan 8. accessed at: <https://www.ncbi.nlm.nih.gov/pubmed/28077305>
- 240 Bashash, M. Prenatal Fluoride Exposure and Cognitive Outcomes in Children at 4 and 6-12 Years of Age in Mexico. *Environ Health Prospect.* 2017 Sep 19;125(9):097017. doi:10.1289/EHP655. accessed at: <https://www.ncbi.nlm.nih.gov/pubmed/28937959>
- 241 Center for Health Action, 3/90.
- 242 Gary Null interview with Dr. William Marcus, 3/10/95.
- 243 Ibid.
- 244 Ibid.
- 245 Ibid.
- 246 Gary Null interview with Dr. John Yiamouyiannis, 3/10/95.
- 247 Gary Null interview with Dr. John Lee, 3/10/95.
- 248 Gary Null interview with Dr. John Yiamouyiannis, 3/10/95.
- 249 Ibid.
- 250 Gary Null interview with Dr. William Marcus, 3/10/95.
- 251 Gary Null interview with Dr. John Yiamouyiannis, 3/10/95.
- 252 Hirzy. Op. cit.
- 253 Ibid.
- 254 Ibid.
- 255 Ibid.
- 256 Ibid.
- 257 Gary Null interview with Dr. John Yiamouyiannis, 3/10/95.
- 258 New York State Coalition Opposed to Fluoridation.
- 259 Longevity Magazine, 7/89.
- 260 Gary Null interview with Dr. John Lee, 3/10/95.
- 261 McLaughlin, Rachel. "Donegal Councilor Says It's Time to End Water Fluoridation." *Donegal Council News*: 24 July 2018. accessed at: <http://www.donegaldaily.com/2018/07/24/donegal-councilor-says-its-time-to-end-water-fluoridation/>
- 262 Should Natick Fluoridate? A Report to the Town and the Board of Selectmen Prepared by the Natick Fluoridation Study Committee 13 E. Central Street,

Town of Natick, MA October 23, 1997

²⁶³ <http://www.fluoridealert.org>

²⁶⁴ Gary Null interview with Dr. John Yiamouyiannis, 3/10/95.

²⁶⁵ Ibid.

²⁶⁶ The Morning Call, 2/7/90

²⁶⁷ The New York Times, 3/13/90.