FLUORIDES IN INDUSTRY AND HEALTH

I. INTRODUCTION TO FLUORINE AND FLUORIDES

Fluorine is a distinctive element in a number of ways. It is a yellowish gas. **It is the most reactive of all the elements,** combining explosively with water, a substance normally so stable that decomposition of pure water occurs only at high temperatures exceeding some 2700°C. At room temperature, however, fluorine gas rips water molecules apart to produce a range of products including oxygen (O_2) and hydrofluoric acid (HF) which are themselves very reactive. Oxygen is the second most reactive element after fluorine, and HF is sufficiently reactive to etch glass. It has been used in the glassware industry to engrave patterns on fine glass and to frost the inside of light bulbs.

Chemists exploited fluorine's reactivity to synthesize the first noble gas compound. Until 1962, chemistry books could say that the noble gases formed no compounds.[1] In that year, chemists reacted fluorine gas with xenon, a clear and colorless gas, to make xenon tetrafluoride (XeF_4), a colorless crystalline solid. Since then other compounds of the noble gases have been synthesized, many of them containing fluorine. Currently only the noble gas helium has no known compounds.

Fluorine has the highest electronegativity of all elements, and thus forms exceedingly stable compounds. For example, the aluminum ore called bauxite is a fluorine compound which is so stable that until the 1800s, no known method existed for easily separating aluminum metal from it. Pure aluminum was scarcer than gold. Napoleon Bonaparte when emperor of France gave banquets using an aluminum table service; at the time, this was more impressive than using dishes made of gold, for aluminum was worth much more.

In the mid 1800s, a method was worked out for refining aluminum inexpensively. Soon it was one of the least expensive metals, since of all metals in the earth's crust it is the most abundant. Only the great stability of the fluoride-containing ore of aluminum had previously made pure aluminum so rare.

The chlorofluorocarbons (CFCs) are another class of fluorine compounds highly valued for their stability. The CFCs include substances like Teflon used to coat non-stick cookware. Normally when food cooks it sticks to the pan because of reactions between the food and metal occurring at cooking temperatures. Teflon is so stable that food cannot react with it so does not stick.

Fluorine occurs as fluoride ion (F^-) in virtually all of its compounds, and is often simply called "fluoride." So-called fluoride compounds, or "fluorides," occur in aluminum refining as mentioned above, and also in other industries such as fertilizer manufacture.

Fluorides occur in traces throughout the environment because most of them are water-soluble and so have been distributed over the earth by water flow in rivers and groundwater (water under the ground). Fluorides are virtually always unwanted; in aluminum refining and in fertilizer manufacture they are unwanted waste products of the industrial process. **Water-soluble fluorides are toxic to living things, and until the 1940s, the traditional use for soluble fluorides was pest control. Sodium fluoride (NaF), for example, was sold as a rat poison and general pesticide.**[2]

With the passing years, the toxicity of soluble fluorides has been increasingly recognized. A recent example involves the compound perfluoro-octanoic acid (PFOA), used in the manufacture of Teflon. DuPont has been discharging small amounts of this chemical into air and water for years, but questions about its potential for causing illness are now being raised after years of assuming it was harmless.[3]

We have now seen that (1) fluorides tend to be extremely stable; (2) soluble fluorides are toxic; and (3) the toxicity of soluble fluorides is being increasingly recognized. Yet along with these facts are other seemingly inconsistent facts: (1) that sodium fluoride, once used as a pesticide, is now used in toothpaste as a cavity fighter;[4] (2) that NaF and other soluble fluorides are added to public water supplies in a process called "fluoridation," and are sometimes administered in tablet form to young children as a tooth decay preventative; and (3) that the American Dental Association (ADA) and other medical organizations claim that fluoride for tooth decay prevention is safe.

Is fluoride somehow toxic when used in pest control and in industry but somehow safe when taken into the human body? We will see that the answer to this question is No.

II. DOCUMENTED HEALTH EFFECTS OF FLUORIDE

Fluoride meets no known human nutritional need. Indeed, aside from claims that fluoride prevents tooth decay (dental caries), fluoride confers no known benefits on human health. Just the reverse is true:

THE TOXIC EFFECTS OF FLUORIDE HAVE BEEN KNOWN FOR DECADES.

In 1943 the *Journal of the American Medical Association* (*JAMA*) published the following:

"Distribution of the element fluorine is so widespread throughout nature that a small intake of the element is practically unavoidable. Fluorides are general protoplasmic poisons, probably because of their capacity to modify the metabolism of cells by changing the permeability of the cell membrane and by inhibiting certain enzyme systems. The exact mechanism of such actions is obscure. The sources of fluorine intoxication are drinking water containing 1 part per million or more of fluorine, fluorine compounds used as insecticidal sprays for fruits and vegetables (cryolite and barium fluosilicate) and the mining and conversion of phosphate rock to superphosphate, which is used as fertilizer. The fluorine content of phosphate rock is about 4 per cent. During conversion to superphosphate, about 25 per cent of the fluorine present is volatilized and represents a pouring into the atmosphere of approximately 25,000 tons of pure fluorine annually. Another source of fluorine intoxication is from the fluorides used in the smelting of many metals, such as steel and aluminum, and in the production of glass, enamel and brick."[5]

Because of the widespread industrial occurrence of fluoride, damage due to its toxicity is very widespread. In fact -

FLUORIDE TOPS OTHER POLLUTANTS IN THE NUMBER OF COURT CASES.

"Certainly, there has been more litigation on alleged damage to agriculture by fluoride than all other pollutants combined."[6] The press does not publicize these cases because of the desire to present fluoride as safe, a point discussed further below.

Known effects of fluoride poisoning include (1) **fluorosis, a discoloring and mottling of the teeth;** (2) bone degeneration, including a withdrawal of calcium from the bones called "demineralization," resulting in the condition called osteoporosis, a condition of weak or brittle bones which easily fracture; (3) hypothyroidism, a condition in which the thyroid gland functions minimally or not at all, producing in turn the condition called "goiter," in which the thyroid gland is enlarged; (4) immune system dysfunction due to protein degradation; (5) and certain types of cancer.

Fluorosis is usually the earliest sign of fluoride poisoning. Initially the teeth are spotted with white, chalky-looking patches; eventually these turn brown and the teeth may easily break due to demineralization.[7] Fluorosis and bone degradation occur because fluoride binds to bone calcium, producing soluble calcium fluoride (CaF_2).[8]

Fluoride, a halogen, also displaces iodine, another halogen, causing hypothyroidism. The body compensates by enlarging the thyroid in an attempt to produce adequate thyroid hormone. Degradation of protein antibodies prevents the immune system from fighting off illness effectively. Cancer results when the immune system is weak, which is why fluoride causes cancer.[9]

Fluoride has been implicated in maladies such as dementia, Alzheimers, and depression, depression resulting from fluoride accumulating in the pineal gland which lowers melatonin levels.[10] The protein degradation which fluoride causes also harms collagen and other connective tissue, resulting in arthritic symptoms.[11] It is possible that symptoms of dementia and Alzheimers commonly attributed to aluminum may be due to fluoride poisoning instead. Unfortunately -

PRESSURE TO PROVE FLUORIDE SAFE HAS HINDERED FLUORIDE TOXICITY STUDIES.

"Since the established view is that [fluoride] is perfectly safe,' little research into possible adverse effects has been carried out on human populations ..."[12] On the other hand, available recent research merely confirms the toxicity of fluoride as it was understood decades ago, and in fact -

THE UNITED NATIONS (UN) RECOGNIZES THAT FLUORIDE IS TOXIC.

"It has long been known that excessive fluoride intake carries serious side effects. But scientists are now debating whether fluoride confers any benefits at all."[13] Indeed, the UN has pointed out that -

FLUORIDE DOES NOT STRENGTHEN THE TEETH.

Instead, fluoride degrades the enzymes of cavity-forming bacteria, thus disabling them: "Fluoride inhibits enzymes that breed acid-producing oral bacteria whose acid eats away at tooth enamel. This observation is valid, but some scientists now believe that the harmful effect of fluoride on other useful enzymes far outweighs the beneficial effect on caries prevention.

"Fluoride ions bind with calcium ions, strengthening tooth enamel as it forms in children. Many researchers now consider this more of an assumption than fact, because of conflicting evidence from studies in India and several other countries ... Excessive fluoride leads to loss of calcium from the tooth matrix, aggravating cavity formation throughout life rather than remedying it, and so causing dental fluorosis."[14] Further -

FLUOROSIS ITSELF AGGRAVATES TOOTH DECAY.

"There is ample evidence that mottled teeth, though they may be somewhat more resistant to the onset of decay, are structurally weak, and that unfortunately when decay does set in, the result is often disastrous. ... Caries once started evidently spreads rapidly. Steps taken to repair the cavities in many cases were unsuccessful, the tooth breaking away when attempts were made to anchor the fillings, so that extraction was the only course."[15] In addition, it is now known that -

FLUORIDE ACTS ONLY ON THE SURFACE OF TEETH (i.e., "TOPICALLY").

It does not act on teeth from inside the body ("systemically"). This means that **the popular rationale for fluoridating water has no basis,** a point which has been made repeatedly:

"Current evidence strongly suggests that fluorides work primarily by topical means through direct action on the teeth and dental plaque. Thus, ingestion of fluoride is not essential for caries prevention ..."[16]

"Recent research on the mechanism of action of [fluoride] in reducing the prevalence of dental caries ... in humans shows that [fluoride] acts topically (at the surface of the teeth) and that there is negligible benefit in actually ingesting it."[17]

"An analysis of national survey data collected by the National Institute of Dental research (NIDR) concludes that children who live in areas of the U.S. where the water supplies are fluoridated have tooth decay rates nearly identical with those who live in non-fluoridated areas."[18] In fact -

THERE IS NO EVIDENCE THAT FLUORIDE STOPS TOOTH DECAY AT ALL.

"There does not seem to be scientific evidence to support the widespread use of fluoride supplements by young children, even in the absence of fluoride in water."[19]

"Increasing water fluoride levels were associated with higher prevalence and severity of dental fluorosis and had no

influence on caries experience in children with poor oral hygiene."[20] Despite decades of "happy talk" about the safety of fluoride -

THE PUBLIC UNDERSTANDS THAT FLUORIDE IS NOT REALLY SAFE.

"The fact that nearly 3 out of every 5 communities which vote on the issue have rejected fluoridation, year after year, does in all likelihood represent a collective judgment on the part of the public that, when all things are considered, fluoridation is not an acceptable public health measure."[21] Pro-fluoridation forces recognize this fact. Accordingly,

PRO-FLUORIDATION FORCES ADVISE CITIES TO SIDE-STEP THE VOTERS.

"Avoid a referendum. The statistics are that 3 out of 4 fluoridation referenda fail."[22]

III. WHY ARE FLUORIDES TOUTED AS SAFE?

Periodically studies appear claiming that fluoride is safe in the human body. Even if the studies contain qualifications about the safety of fluoride, newspapers quote the studies as proving that fluoride is safe. We consider two examples. These examples must be considered in light of the fact that in the United States, the Food and Drug Administration (FDA) is required by law to approve all substances prescribed for medical therapy. **Yet the FDA has never approved the therapeutic use of fluoride in drinking water:**

"The water fluoridation debate has been raging for fifty years. ... However, no clinical trials have been conducted and submitted to the FDA to demonstrate the effectiveness of ingesting fluoride. ... The reason this has not happened in half a century is because the promoters of fluoride supplements dare not go anywhere near the FDA, fully aware that they could never meet the requirements of demonstrating safety and effectiveness. Rejection by the FDA of petitions for fluoride supplements would be the death knell for water fluoridation, so the FDA and the law are simply ignored."[23]

In 1999 the Centers for Disease Control (CDC) claimed that "as a result [of water fluoridation], dental caries declined precipitously during the second half of the 20th century." What the CDC failed to point out was that **tooth decay has declined in most Western countries because of better hygiene, including countries that do not fluoridate.**[24]

In another study, the *British Medical Journal* (*BMJ*) published research carried out by personnel mostly at the University of York, England. This became known as the "York study."

The York study cautiously concluded that fluoride in drinking water (1) reduces tooth decay; (2) increases fluorosis; and (3) causes no other negative effects such as bone fractures.[25] An editorial accompanying the York study optimistically stated that the York study "should alleviate remaining concerns about the safety of fluoridation."[26] Newspapers picked up on the unguarded editorial comments, concluding that fluoridation had been proven totally safe. But had it?

The British Medical Journal published 17 letters and e-mails responding to the York study. Only one supported the study; the rest emphasized that the York study omitted or misinterpreted data to produce the unwarranted conclusion that fluoride is fairly safe. **The York study itself admitted that fluoride safety remains "controversial."**[27]

Two of the York study authors later reproached the press for using the York study to make overly optimistic claims about fluoride safety: "We suggest caution against overinterpretation of our results and emphasize again that the quality of these data on benefit and harm is only low to moderate."[28]

The fate of the York study is typical of the fate of other studies claiming fluoride is safe. On close examination such studies are found to contain omissions and misinterpretations which twist the data toward the desired conclusion of fluoride safety.[29] Fluoride should have been shown to be safe before it was ever added to drinking water. This was not done, with the result that with fluoridation now widespread, York-type studies are "needed" to rationalize the practice.

What is the reason for the continued effort to convince the public of fluoride safety? In chronological order, they are (1) the profit motive of the aluminum industry; (2) the wartime needs of the nuclear industry; and (3) the vested interests of medical organizations and government bureaucracies.

As mentioned above, aluminum refining produces tons of fluoride waste yearly. Early in the 1900s the Aluminum Company of America (ALCOA) conceived the idea that this waste might be purified and sold for use as a fluoride supplement and as a drinking water additive.

Though used as a pesticide, early medical studies suggested that low doses of fluoride might prevent tooth decay. **These studies have now been shown to be misleading.**[30] ALCOA acted on these studies and began the campaign for water fluoridation in various cities. The first city to fluoridate its water was Grand Rapids, Michigan, in 1945.

By then, World War II was raging, and the United States was developing the first atom bombs powered by fission of uranium-235. Uranium-235 must be separated from the more common isotope of uranium, uranium-238, which does not support a fission chain reaction. The separation process, called "enrichment," involved reacting the uranium with fluorine to produce the gas uranium hexafluoride, UF_6. In the form of this gas, uranium-235 was separated from non-fissionable U-238.

However, in the uranium enrichment process fluoride gas escaped to the surrounding countryside. Neighboring orchards, crops, and cattle began dying. Due to the need for secrecy in the nuclear weapons program, the government refused to admit guilt, instead reaching out-of-court settlements to avoid publicity. **The pattern of covering up the toxicity of fluoride which began near the end of World War II persists to this day.**[31]

Widespread public awareness of fluoride toxicity would be a public relations nightmare for the aluminum industry. The nuclear power industry, which continues to rely on uranium enrichment, would also suffer from bad press about fluoride's toxicity.

Since the mid-1940s when the ADA bought into claims that fluoride is safe, there has been an institutional inertia resisting change in this position. The ADA, the U.S. Public Health Service (USPHS), the CDC, and other endorsers would lose credibility if they admitted that fluoride is toxic.

This would not be the first time the medical profession has been wrong. Two centuries ago leeches were used to "cure" illness on the basis that by sucking out "bad blood" the patient would be made well. George Washington's death in 1799 was due not to actual illness but to blood loss due to "leech therapy."

A century ago Sears, Roebuck, and other retailers touted arsenic tablets as an aid to a woman's complexion.[32] Arsenic tablets, guaranteed safe, would produce a fashionably pale appearance due to the lethal anemia brought on by arsenic poisoning.

Until about 1900 cocaine was a legal drug prescribed for many maladies. Coca-Cola gets its name from the cocaine ("coke") contained in the original formula. As recently as the 1950s X-ray machines called "fluoroscopes" were used in shoe stores for fitting shoes. The X-rays were thought to be safe until children who had used the fluoroscopes grew into adults with bone cancer.[33]

The pendulum may be swinging back against the use of fluoride supplements and fluoridated water. A major trade journal, *Chemical and Engineering News* (*CEN*), has repeatedly criticized fluoride use, pointing out that, "Many people who drink water that meets the EPA standard may have some degree of skeletal fluorosis,"[34] and that the claimed decrease in tooth decay attributed to fluoride "may not be statistically significant."[35]

Another article in *CEN* made an even stronger claim: "We are left with compelling evidence that powerful interests with high financial stakes have colluded to prematurely close honest discussion and investigation into fluoride toxicity."[36]

CONCLUSIONS

Fluorine and fluorides have many industrial uses but no consistently documented benefit in the human body. Fluoride ingestion should be avoided by (1) drinking distilled water; (2) not drinking black and green teas which are rich in fluoride;[37] (3) using non-fluoride toothpaste. A nutritious diet rich in the anti-oxidant vitamins (e.g., A, C, E) aids the body in minimizing the effects of fluoride toxicity.[38]

Aside from toxicity issues, it is odd that fluoride, a drug, should be added to the water supply for purposes of what amounts to medical treatment with the side effect of unsightly fluorosis. As one dental surgeon has put it:

"Fifty percent of our population has dental fluorosis. I see patients daily in my surgery who are damaged by fluoride. They do not smile, they are teased at school, and they are traumatized by having `rotten' teeth. ... The idea of mass medicating an entire population is inherently flawed. When I prescribe drugs I do so with the knowledge of the patient's age, weight, and medical history. Water fluoridation is prescribed by thirst. The more you drink the more you get. Is this science?"[39]

Notes

1 Reference works made this claim up to 1962. One reference, for example, claimed that the inert gases "do not react with any element" (Jesse R. Swoap, "Elements," *Young People's Science Encyclopedia*, Childrens Press, 1962, Vol. 6, p. 589).

2 John Yiamouyiannis, *Fluoride: The Aging Factor*, Health Action Press, 1986, p. 112. A photograph is shown of a one-pound can of NaF manufactured by McKesson and labeled as an insecticide. The main fluoride pesticide in current use is "cryolite" (sodium aluminum fluoride, $NaAlF_4$), used as an insecticide on some 30 fruits and vegetables (www.fluoridealert.org/f-sources.htm).

3 Cheryl Hogue, "Perfluorinated Pollutant Puzzle," *Chemical and Engineering News* (*CEN*), Vol. 823 no. 235, August 30, 2004, p. 17.

4 "Crest," a product of Proctor & Gamble, was the first toothpaste to contain fluoride. The fluoride was in the form of stannous fluoride (SnF_2) which was marketed as "fluoristan." **Presently, the fluoride in Crest is in the form of sodium fluoride (NaF), the same substance once used as a pesticide.** Because of the risk of fluoride poisoning from ingesting NaF, Crest warns, "If more than used for brushing is accidentally swallowed, get medical help or contact a Poison Control Center right away" (Crest Lot 3 3616, expiration date January 2005).

5 "Chronic Fluorine Intoxication," *Journal of the American Medical Association* (*JAMA*), Vol. 123, September 18, 1943, p. 150; Christopher Bryson, *The Fluoride Deception*, Seven Stories Press, 2004, pp. 27, 35. The toxic effects of fluoride had been documented decades before the 1940s, as discussed by Kaj Roholm, *Fluorine Intoxication: A Clinical-Hygienic Study, with a Review of the Literature and Some Experimental Investigations*, H.K. Lewis, London, 1937, pp. 11-35, 292-306, 317-321.

One of the worst air pollution disasters of the 1900s occurred in the Meuse Valley, Belgium, in 1930. The widespread death and illness in this episode traditionally has been blamed on sulfur dioxide (SO_2) pollution, but the real culprit was fluoride released into the air (ibid., p. 126; Bryson, op. cit., p. 34). Likewise, the worst air pollution disaster in the United States, in Donora, Pennsylvania, in 1948, though conventionally attributed to SO_2 pollution, was actually a case of air-borne fluoride poisoning (ibid., p. 120).

6 L.H. Wienstein, "Effects of Fluorides on Plants and Plant Communities: An Overview," in James .L. Shupe, H.B. Peterson, and N.C. Leone, eds., *Fluorides: Effects on Vegetation, Animals and Human: Proceedings og an International Symposium on Fluorides*, Utah State University, Logan, Utah, May 24-27, 1982, Paragon Press, 1983, p. 53 (www.fluoridealert.org/f-pollution.htm); Bryson, op. cit., pp. xv, 197.

7 "The prevalence of fluorosis (mottled teeth) is highly associated with the concentration of fluoride in drinking water" (Marian S. McDonagh et al., "Systematic Review of Water Fluoridation," *British Medical Journal* (*BMJ*), Vol. 321, October 7, 2000, p. 855).

"Fluorosis is an indication of a toxic effect of fluoride, in a similar way that the blue line on gums is an indicator of lead poisoning" (Paul Connett, "Critical Difference Was Overlooked," *BMJ*, Vol. 322, June 16, 2001, p. 1486).

"Dental fluorosis ... is the first visible sign of poisoning by fluoride, which is as toxic as arsenic and lead" (S.L.M. Gibson and R.G. Gibson, "Clearer Evidence of Benefits and Risks Is Needed," *BMJ*, Vol. 322, June 16, 2001, p. 1486).

8 Fluoride binding with calcium in bone is also why the phosphate mined for fertilizer is rich in fluoride. Indeed, in humans, "[a]bout half of ingested

fluoride is stored in bone" (B. Hileman, "Fluoride Risks Are Still a Challenge," *CEN*, Vol. 84 no. 36, September 4, 2006, p. 34). The phosphate originated from the skeletons of manatees and other water-dwelling creatures buried in huge storms soon after the biblical Flood. Natural fluoride in the environment was concentrated in the bones of these creatures, causing high fluoride concentrations in mined phosphate.

Waste water from phosphate processing is also relatively rich in fluoride. In central Florida, for example, Cargill Corporation mines several hundred million tons of phosphate annually. In September 2004, one of Cargill's huge waste water ponds breached its earthen wall during rains due to hurricane Frances. The news media publicized the massive fish kills and other environmental damage the acidity of the spill would cause, but fluoride contamination is also a potential problem (Janet Zink, "Fertilizer Plant's Spill Tops 41-Million Gallons," *St. Petersburg Times* (*SPT*), September 7, 2004, p. 3B; Janet Zink, "Acidic Spill Corrodes Reputation," *SPT*, September 8, 2004, p. 3B).

Florida has"one of the world's largest supplies of natural phosphate," processed to fluosilicic acid for fluoridation (Bryson, op. cit., p. 149); 90% of fluoridated water in the U.S. uses "silicofluoride 'scrubbed' from the smokestacks of the Florida phosphate industry" (ibid., p. 224). Since fluoridation is funded with public monies, the fluoride from Florida phosphate in effect is "collected [and] billed to the taxpayer" (ibid., p. 225), and the Florida phosphate industry is thereby paid to "dispose of their most troublesome toxic waste" (ibid., p. 150). Fluoride is probably the only toxic waste discarded by putting it *intentionally* into people's bodies!

9 Thyroid malfunction: ibid., p. 225. In animals, 3-6 mg/kg of fluoride daily "disrupt thyroid function … as the concentration of fluoride in water goes up, the prevalence of goiter … increases …" (Hileman, op. cit., p. 35).

Cancer: Yiamouyiannis, op. cit., pp. 22, 59-62. "In point of fact, fluoride causes more human cancer death, and causes it faster, than any other chemical" (Dean Burke, Chief Chemist Emeritus, U.S. National Cancer Institute; cited in ibid., p. 63).

10 Dementia and Alzheimer's: "Fluoride at levels found in drinking water affects brain function in adults … [F]luoride impairs the brain's ability to perform signaling functions" (Hileman, op. cit., p. 35). In rats, fluoride causes brain degradation, tangles and plaques, "similar to the abnormalities found in Alzheimer's disease …" (ibid., p. 36).

Fluoride has also been found to cause hyperactivity in rats (Bryson, op. cit., p. 18; P.M. Mullinix, P.K. Den besten, A. Schunior, and W.J. Kernan, "Neurotoxicity of Sodium Fluoride in Rats," *Neurotoxicology and Teratology*, Vol. 2, 1995, pp. 175-176), and has been linked to central nervous system degradation generally (Bryson, op. cit., p. 225), a linkage known since the 1940s (ibid., p. 27).

Depression: "It would appear that fluoride accumulates in the human pineal gland and experiments in animals indicate that fluoride lowers melatonin levels" (Connett, op. cit., p. 1486).

In addition, fluoride is associated with Down's syndrome (Bryson, op. cit., p. 225). It has been estimated that "if no drinking water were fluoridated in the [U.S.], there would be 200 to 500 fewer babies with Down syndrome born each year" (Hileman, op. cit., p. 36).

11 Connett, op. cit., p. 37. **Collagen damage also results in premature aging:** "Fluoride not only causes the immune system to act like the immune system of an `old' person, it causes autoimmune damage to the entire body and accelerates the aging process of that body [including causing arthritic symptoms]. The low levels at which fluoride exerts its deleterious effects indicates that there may be no safe level of fluoride" (ibid., p. 27). The aging symptoms include arthritis.

In the U.S., there is now "an epidemic of arthritis," possibly associated with the widespread practice of water fluoridation (Bryson, op. cit., pp. 219, 225).

Fluoride not only causes an earlier onset of symptoms of old age. It has also been linked with an earlier onset of puberty in females (ibid., p. 224).

12 S.L.M. Gibson, "Fluoride," *BMJ* Rapid Responses, November 7, 2000 (bmj.bmjjournals.com/cgi/eletters/321/7265/ 855).

13 United Nations Childrens Fund (UNICEF), *Fluoride in Water: An Overview*, UN, 1999, p. 1 (www.unicef.org/wes/fluoride.pdf).

14 ibid., p. 2. In humans, fluorides interfere with enzyme activity at a fluoride level of 1 ppm, the concentration of fluoride routinely added to fluoridate water (Yiamouyiannis, op. cit., p. 73). The effect of fluoride on enzymes can be crippling (Bryson, op. cit., p. xx), a point taken up in G.L. Waldbott, A.W Burgstahler, and H.L. McKinney, *Fluoridation: The Great Dilemma*, Coronado Press, 1978, pp. 149-151, 361.

15 M.C. Smith and H.V. Smith, "Observations on the Durability of Mottled Teeth," *American Journal of Public Health*, Vol. 30, 1940, pp. 1050-1052. More recent similar claims have been made: "In consideration of the currently understood mechanisms of ... fluorosis [i.e., it doesn't strengthen teeth but works by killing bacteria in the mouth], our efforts should be focused on minimizing levels of ingested fluorides. ... We cannot ... ignore water fluoridation as a major source of ingested fluoride" (Keith E. Heller, Stephen A. Eklund, and Brian A. Burt, "Dental Caries and Dental Fluorosis at Varying Water Fluoride Concentrations," *Journal of Public Health Dentistry*, Vol. 57, 1997, p. 142).

16 John J. Warren and Steven M. Levy, "Current and Future Role of Fluoride in Nutrition," *The Dental Clinics of North America*, Vol. 47, 2003, p. 225; Bryson, op. cit., p. xx.

17 Mark D. Diesendorf, John Colquhoun, Bruce J. Spittle, Douglas N. Everingham, and Frederick W. Clutterbuck, "New Evidence on Fluoridation," *Australian and New Zealand Journal of Public Health*, Vol. 21, 1997, p. 187.

18 B. Hileman, "New Studies Cast Doubt on Fluoridation Benefits," *CEN*, May 8, 1989 (www.fluoridealert.org/ f-teeth.htm).

19 Paul J. Riordan, "Fluoride Supplements for Young Children:An Analysis of the Literature Focusing on Benefits and Risks," *Community Dentistry and Oral Epidemiology*, Vol. 27, 1999, p. 82.

20 R. Banu Ermis, Fatma Koray, and Guniz Akdeniz, "Dental Caries and Fluorosis in Low- and High-Fluoride Areas in Turkey," *Quintessence International*, Vol. 34, 2003, p. 354. It has long been known that high fluoride levels comparable to the level allowed by the EPA (4 ppm) in natural waters of Turkey and India makes people chronically ill (Yiamouyiannis, op. cit., pp. 1-3).

21 Edward Groth III, Ph.D. Dissertation, Stanford University, May 1973 (www.fluoridealert.org/communities.htm).

22 Letter from Susan Allan, RDH, BS, Florida HRS Fluoridation Coordinator, to Herb Tolson, Director of Inner City Governmental Relations, St. Petersburg, FL, May 7, 1990. A more conservative estimate is that voter referenda have rejected fluoridation "about half the time" (Hileman, op. cit., p. 34), nevertheless indicating no groundswell of public support for fluoridation.

23 Letter from John V. Kelly, Assemblyman 36th District, NJ, to Senator Robert Smith, Chairman, Environment and Public Works Committee, August 14, 2000 (www.fluoridealert.org/fda.htm).

24 "Tooth Decay Trends in Fluoridated vs. Unfluoridated Countries" (www.fluorideaction.org/who-dmft.htm). Most European countries do not fluoridate (Bryson, op. cit., p. xix).

25 McDonagh et al., op. cit., p. 855.

26 Hannu W. Hausen, "Fluoridation Fractures, and Teeth," *BMJ*, Vol. 321, October 7, 2001, p. 844.

27 McDonagh et al., op. cit., p. 859.

28 Marian S. McDonagh and Jos Kleijnen, "Reply to `Government Should Meet Commitment Made in White Paper'," *BMJ*, Vol. 322, June 16, 2001, p. 1486.

29 One omission, for example, involved the partial reporting of bone fracture data in an unpublished report available to the York team (Li, Y., et al., "Effect of Long Term Exposure to Fluoridation in Drinking Water on Risks of Bone Fractures, 1999); the data were selected to enable the York study to conclude that there is "no clear evidence" of bone fractures or other toxic effects of fluoride save fluorosis (McDonagh et al., op. cit., p. 855; Connett, op. cit., p. 1486).

In the same issue of *BMJ* as the York study was another paper concluding that, "Long term exposure to fluoridated drinking water does not increase the risk of fracture" (K.R. Phipps et al., "Community Water Fluoridation, Bone

Mineral Density, and Fractures: Prospective Study of Effects in Older Women," *BMJ*, Vol. 321, October 7, 2000, p. 860). As in the York study, some critical points were left unmentioned. Since fluoride demineralizes bone, **the normal role of the bone-destroying cells (osteoclasts) is minimized,** leading to the claim that bone-building cells (osteoblasts) are working more effectively.

However, "The new bone formed is weak and structurally abnormal because of fluoride's alteration of the normal remodelling process" (T.C. Schmidt, "Results Should Be Viewed with Concern Rather Than Applause," *BMJ*, Vol. 322, June 16, 2001, p. 1486).

It is quite possible that fluoride poisoning is associated with the epidemic rise in hip fractures in older people, despite claims such as those of Phipps et al. The U.S. has "one of the highest rates of hip fracture in the world" (Bryson, op. cit., p. 219), and fluoride has been implicated (Christa Danielson, Joseph L. Lyon, M. Egger, and G.K. Goodenough., "Hip Fractures and Fluoridation in Utah's Elderly Population, *JAMA*, Vol. 268, August 12, 1992, p. 746).

The current EPA ceiling for fluoride in water, 4 ppm, "would permit crippling bone injuries in a very great many people" (Bryson, op. cit., p. 222). A sign of how devastating this difficulty has become appeared in *Time* magazine (Adrian Dobs, "The Brittle Truth: It's Never Too Early or Too Late to Pay Attention to Your Bones, " *Time*, Vol. 168 no. 12, September 12, 2006, pp. 72, 75). This piece emphasized the epidemic of brittle bones in women. Yet no advice was offered to minimize fluoride intake. Instead, in the midst of this piece, on pages 74 and 75, was an advertisement for Boniva, manufactured by Roche for treatment of osteoporosis. Side effects of Boniva include "severe bone, joint, and/or muscle pain" (p. 73), the very symptoms the drug is supposed to mitigate. Further, its "efficacy was not assesed" in clinical comparisons with Fosamax (p. 73)!

Thus with caveats expressed about the safety and effectiveness of Boniva, it was nevertheless the remedy offered for mitigation of what may well be the results of chronic fluoride poisoning. The "Brittle Bones" piece by Dobs (op. cit., p. 72) claimed that "placement of ads in this section in no way implies any endorsement or recommendation of these products …" The physical intermingling of the advertisement pages among the pages of the article said otherwise.

30 One of the earliest studies claiming fluoride benefits was dated 1937; Yiamouyiannis (op. cit., pp. 94-110, 88-90, 142-160) discusses the fallacies of these early studies and others spanning several decades.

"The basis for the widespread acceptance of fluoride supplements in caries prevention is a large number of mostly small clinical trials in the late 1950s and [early] 1960s ... The early studies have been reviewed again recently in a series of publications and they have again been criticized. The criticisms are serious and virtually none of the early fluoride supplement studies would be published today, because of methodological and other shortcomings. They present conclusions that are not supported by their data or consistent with their designs" (Riordan, op. cit., p. 73).

31 Fluoride damage to the central nervous system was acknowledged in a "secret" government memo dated April 29, 1944, but could not be publicly acknowledged lest the atomic bomb program be jeopardized (Bryson, op. cit., p. 46), the same reason that farmers with fluoride-damaged crops and herds were granted out-of-court settlements (ibid., p. 75).

The USPHS "camouflaged" fluoride hazards for the sake of the atomic bomb program (Bryson, op. cit., p. 80). **The ADA eventually followed suit and gave in to the pressure to minimize the toxicity of fluoride.** In 1951 the two organizations held a meeting of state dental directors to promote fluoridation of water. Frank Bull, Director of Dental Education for the Wisconsin State Board of Health, gave an address entitled "What Are We Waiting For?" in which he made the following remarks:

"Now, we tell them this, that at one part per million dental fluorosis brings about the most beautiful looking teeth that anyone ever had. And we show them some pictures of such teeth. We don't try to say there is no such thing as fluorosis, even at 1.2 parts per million, which we are recommending. But you have got to have an answer. Maybe you have a better one. ...

"Now in regard to toxicity -- I noticed that Dr. Bain used the term adding 'sodium fluoride.' We never do that. That is rat poison. You add fluorides. Never mind that sodium fluoride business. ... The question of toxicity ... lay off it altogether. Just pass it over. `We know there is absolutely no effect other than reducing tooth decay,' you say and go on" (Yiamouyiannis, op. cit., p. 139).

Earlier, the aluminum industry had fostered a climate in which questions of fluoride safety were swept aside in the interest of profitability. The USPHS was under the Treasury Department, and in the 1930s, the Treasury Secretary was **Andrew Mellon, a founder and major stockholder of ALCOA** (Bryson, op. cit., p. 43).

32 Sears, Roebuck claimed that with Dr. Rose's French Arsenic Complexion Wafers, "all danger is averted." Sears Roebuck *Catalog*, 1902, p. 447; reprinted by Crown Publishers, 1969.

33 Amazingly, as recently as 1955 shoe buyers were pressured to use fluoroscopes in much the same way that fluoride supplements and fluoridation are touted today (Lydia Strong, "X-Rays Can Be Dangerous," *Coronet*, Vol. 38 no.4, August, 1955, p. 51).

34 B. Hileman, "Fluoride Concerns Surface Once Again," *CEN*, Vol. 81 no. 34, August 25, 2003, p. 22.

35 ibid., p. 23.

36 Sheldon Krimsky, "Is Fluoride Really All That Safe?," *CEN*, Vol. 82 no. 33, August 16, 2004, p. 35.

37 "Tea is a popular drink around the world. It is also one of the major sources of fluoride intake. ... The mean fluoride concentrations in leaf tea [from Taiwan] were 7.04, 7.79, 5.37, and 25.7 mg/L [ppm], respectively. Most of the intake concentrations in these samples exceeded 4 mg/L [4 ppm] F, the lower bound of fluoride levels reported in the literatures to be associated with a lower IQ in children and a higher risk of bone fracture" (Shih-Chung Candice Lung, Pao-Kuei Hsaio, and Kuang-Mao Chiang, "Fluoride Concentrations in Three Types of Commercially Packed Tea Drinks in Taiwan," *Journal of Exposure Analysis and Environmental Epidemiology*, Vol. 13, 2003, p. 66).

38 "Frequently Asked Questions" (www.fluoridealert.org/faqs.htm).

39 Don MacAuley, "Ireland Has Less Decay in Non-Fluoridated Communities," *BMJ*, Vol. 322, June 16, 2001, p. 1486.