Submitted by
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FLUORIDE ACTION NETWORK

50 Reasons to Oppose Fluoridation

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Introduction

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

Fluoridation is a bad medical practice

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

   > "Water fluoridation goes against leading principles of pharmacotherapy, which is progressing from a stereotyped medication -- of the type 1 tablet 3 times a day -- to a much more individualized therapy as regards both dosage and selection of drugs. The addition of drugs to the drinking water means exactly the opposite of an individualized therapy" (Carlsson 1978).

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

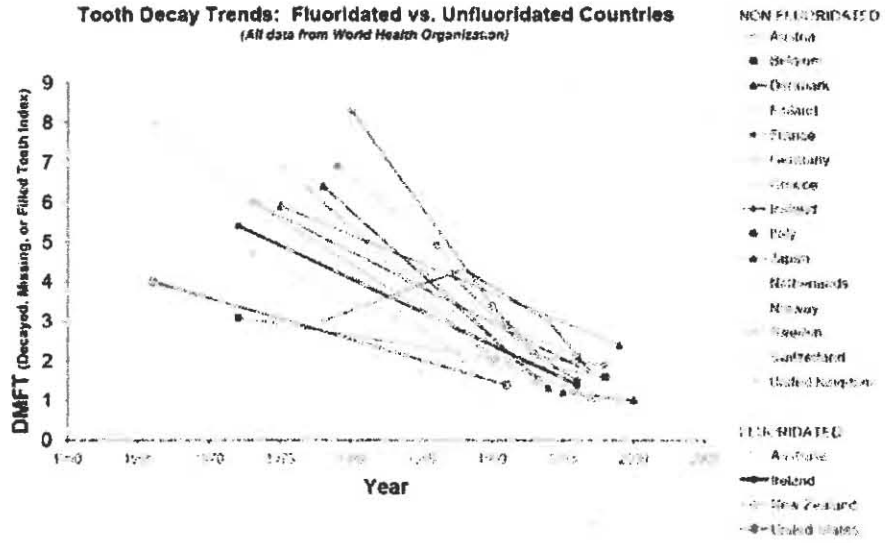
(Strunecka & Patocka 1999; Li 2003). More and more studies are indicating that fluoride can interfere with biochemistry in fundamental ways (Barbier 2010).

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

Swallowing fluoride provides no (or very little) benefit

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

Figure 1.



13. **Fluoridation's role in the decline of tooth decay is in serious doubt.** The largest survey ever conducted in the US (over 39,000 children from 84 communities) by the National Institute of Dental Research showed little difference in tooth decay among children in fluoridated and non-fluoridated communities (Hileman 1989). According to NIDR researchers, the study found an average difference of only 0.6 DMFS (Decayed, Missing, and Filled Surfaces) in the permanent teeth of children aged 5-17 residing their entire lives in either fluoridated or unfluoridated areas (Brunelle & Carlos, 1990). This difference is less than one tooth surface, and less than 1% of the 100+ tooth surfaces available in a child's mouth. Large surveys from three Australian states have found even less of a benefit, with decay reductions ranging from 0 to 0.3 of one permanent tooth surface (Spencer 1996; Armfield & Spencer 2004). None of these studies have allowed for the possible delayed eruption of the teeth that may be caused by exposure to fluoride, for which there is some evidence (Komarek 2005). A one-year delay in eruption of the permanent teeth would eliminate the very small benefit recorded in these modern studies.
14. **NIH-funded study on individual fluoride ingestion and tooth decay failed to find a significant correlation.** A multi-million dollar, U.S. National Institutes of Health (NIH) -funded study (Warren 2009) found no relation between tooth decay and the

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

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

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

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

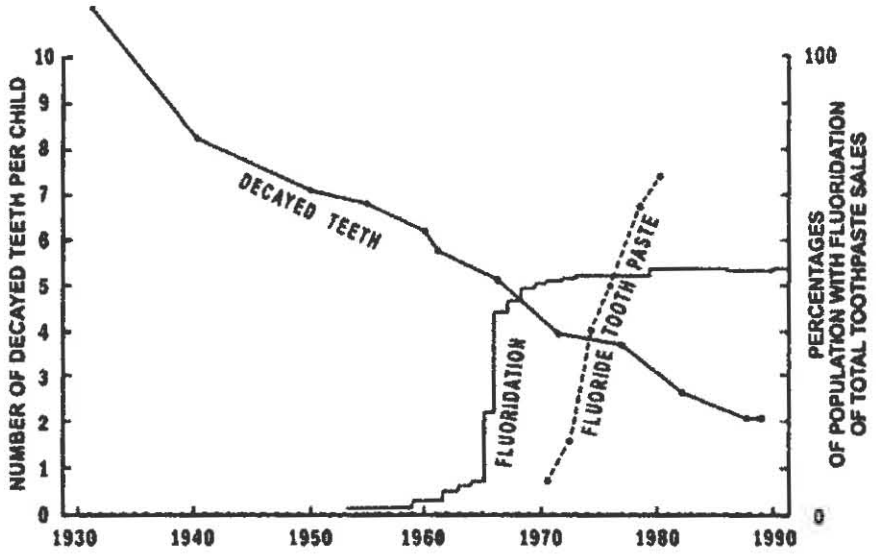


Figure 2. The number of decayed teeth in 5-year olds in New Zealand, over the period 1930-1990. The percentage of the population drinking fluoridated water and the percentage of the total toothpaste sold containing fluoride are shown on the right hand axis (Colquhoun, 1993).

18. **The studies that launched fluoridation were methodologically flawed.** The early trials conducted between 1945 and 1955 in North America that helped to launch fluoridation, have been heavily criticized for their poor methodology and poor choice of control communities (De Stefano 1954; Sutton 1959, 1960, 1996; Ziegelbecker 1970). According to Dr. Hubert Arnold, a statistician from the University of California at Davis, the early fluoridation trials "are especially rich in fallacies, improper design, invalid use of statistical methods, omissions of contrary data, and just plain muddleheadedness and hebetude." Serious questions have also been raised about Trendley Dean's (the father of fluoridation) famous 21-city study from 1942 (Ziegelbecker 1981).

Children are being over-exposed to fluoride

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

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

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

Evidence of harm to other tissues

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

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

23. **Fluoride may lower IQ**. There have now been 24 studies from China, Iran, India and Mexico that have reported an association between fluoride exposure and reduced IQ. One of these studies (Lin Fa-Fu 1991) indicates that even just moderate levels of fluoride exposure (e.g., 0.9 ppm in the water) can exacerbate the neurological defects of iodine deficiency. In the absence of iodine deficiency, another research team (Xiang 2003a,b) estimated that fluoride may lower IQ at 1.9 ppm, while a recent preliminary study (Ding 2011) found a lowering of IQ in children drinking water at levels ranging from 0.3 to 3 ppm. The authors of this latter study reported that for each increase of 1 ppm fluoride measured in the urine there was a loss of 0.59 IQ points. None of these studies indicates an adequate margin of safety to protect all children drinking artificially fluoridated water from this affect. According to the National Research Council (2006), "the consistency of the results [in fluoride/IQ studies] appears significant enough to warrant additional research on the effects of fluoride on intelligence." Except for an early and small IQ study from New Zealand (Shannon et al., 1986) no fluoridating country has investigated the matter for themselves.

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

25. **Fluoride affects the pineal gland.** Studies by Jennifer Luke (2001) show that fluoride accumulates in the human pineal gland to very high levels. In her Ph.D. thesis, Luke has also shown in animal studies that fluoride reduces melatonin production and leads to an earlier onset of puberty (Luke 1997). Consistent with Luke's findings, one of the earliest fluoridation trials in the U.S. (Schlesinger 1956) reported that on average young girls in the fluoridated community reached menstruation 5 months earlier than girls in the non-fluoridated community. Inexplicably, no fluoridating country has attempted to reproduce either Luke's or Schlesinger's findings or examine the issue any further.

26. **Fluoride affects thyroid function.** According to the U.S. National Research Council (2006), "several lines of information indicate an effect of fluoride exposure on thyroid function." In the Ukraine, Bachinskii (1995) found a lowering of thyroid function, among otherwise healthy people, at 2.3 ppm fluoride in water. In the middle of the 20th century, fluoride was prescribed by a number of European doctors to reduce the activity of the thyroid gland for those suffering from hyperthyroidism (overactive thyroid) (Stecher 1960; Waldbott 1978). According to a clinical study by Galletti and Joyet (1958), the thyroid function of hyperthyroid patients was effectively reduced at just 2.3 to 4.5 mg/day of fluoride ion. To put this finding in perspective, the Department of Health and Human Services (DHHS, 1991) has estimated that total fluoride exposure in fluoridated communities ranges from 1.6 to 6.6 mg/day. This is a remarkable fact, particularly considering the rampant and increasing problem of hypothyroidism (underactive thyroid) in the United States and other fluoridated countries. Symptoms of hypothyroidism include depression, fatigue, weight gain, muscle and joint pains, increased cholesterol levels, and heart disease. In 2010, the second most prescribed drug of the year was Synthroid (sodium levothyroxine) which is a hormone replacement drug used to treat an underactive thyroid.

27. **Fluoride causes arthritic symptoms**. Some of the early symptoms of skeletal fluorosis (a fluoride-induced bone and joint disease that impacts millions of people in India, China, and Africa), mimic the symptoms of arthritis (Singh 1963; Franke 1975; Teotia 1976; Carnow 1981; Czerwinski 1988; DHHS 1991). According to a review on fluoridation published in Chemical & Engineering News, "Because some of the clinical symptoms mimic arthritis, the first two clinical phases of skeletal fluorosis could be easily misdiagnosed" (Hileman 1988). Few, if any, studies have been done to determine the extent of this misdiagnosis, and whether the high prevalence of arthritis in America (1 in 3 Americans have some form of arthritis - CDC, 2002) and other fluoridated countries is related to growing fluoride exposure, which is highly plausible. Even when individuals in

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

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

29. **Fluoride may increase hip fractures in the elderly.** When high doses of fluoride (average 26 mg per day) were used in trials to treat patients with osteoporosis in an effort to harden their bones and reduce fracture rates, it actually led to a higher number of fractures, particularly hip fractures (Inkovaara 1975; Gerster 1983; Dambacher 1986; O'Duffy 1986; Hedlund 1989; Bayley 1990; Gutteridge 1990, 2002; Orcel 1990; Riggs 1990 and Schnitzler 1990). Hip fracture is a very serious issue for the elderly, often leading to a loss of independence or a shortened life. There have been over a dozen studies published since 1990 that have investigated a possible relationship between hip fractures and long term consumption of artificially fluoridated water or water with high natural levels. The results have been mixed -- some have found an association and others have not. Some have even claimed a protective effect. One very important study in China, which examined hip fractures in six Chinese villages, found what appears to be a dose-related increase in hip fracture as the concentration of fluoride rose from 1 ppm to 8 ppm (Li 2001) offering little comfort to those who drink a lot of fluoridated water. Moreover, in the only human epidemiological study to assess bone strength as a function of bone fluoride concentration, researchers from the University of Toronto found that (as with animal studies) the strength of bone declined with increasing fluoride content (Chachra 2010). Finally, a recent study from Iowa (Levy 2009), published data suggesting that low-level fluoride exposure may have a detrimental effect on cortical bone density in girls (an effect that has been repeatedly documented in clinical trials and which has been posited as an important mechanism by which fluoride may increase bone fracture rates).

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

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

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

33. **Fluoride may cause reproductive problems.** Fluoride administered to animals at high doses wreaks havoc on the male reproductive system - it damages sperm and increases the rate of infertility in a number of different species (Kour 1980; Chinoy 1989; Chinoy 1991; Susheela 1991; Chinoy 1994; Kumar 1994; Narayana 1994a,b; Zhao 1995; Elbetieha 2000; Ghosh 2002; Zakrzewska 2002). In addition, an epidemiological study from the US found increased rates of infertility among couples living in areas with 3 ppm or more fluoride in the water (Freni 1994), two studies have found reduced level of circulating testosterone in males living in high fluoride areas (Susheela 1996; Barot 1998), and a study of fluoride-exposed workers reported a "subclinical reproductive effect" (Ortiz-Perez 2003). While animal studies by FDA researchers have failed to find evidence of reproductive toxicity in fluoride-exposed rats (Sprando 1996, 1997, 1998), the National Research Council (2006) has recommended that, "the relationship between fluoride and fertility requires additional study."

34. **Some individuals are highly sensitive to low levels of fluoride** as shown by case studies and double blind studies (Shea 1967; Waldbott 1978; Moolenburgh 1987). In one study, which lasted 13 years, Feltman and Kosel (1961) showed that about 1% of patients given 1 mg of fluoride each day developed negative reactions. Many individuals have reported suffering from symptoms such as fatigue, headaches, rashes and stomach and gastro intestinal tract problems, which disappear when they

avoid fluoride in their water and diet. Frequently the symptoms reappear when they are unwittingly exposed to fluoride again (Spittle, 2003). No fluoridating government has conducted scientific studies to take this issue beyond these anecdotal reports. Without the willingness of governments to investigate these reports scientifically, should we as a society be forcing these people to ingest fluoride?

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

No Margin of Safety

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

Environmental Justice

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

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

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

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

40. **Tooth decay reflects low-income not low-fluoride intake**. Since dental decay is most concentrated in poor communities, we should be spending our efforts trying to increase the access to dental care for low-income families. The highest rates of tooth decay today can be found in low-income areas that have been fluoridated for many years. The real "Oral Health Crisis" that exists today in the United States, is not a lack of fluoride but poverty and lack of dental insurance. The Surgeon General has estimated that 80% of dentists in the US do not treat children on Medicaid.

The largely untested chemicals used in fluoridation programs

41. **The chemicals used to fluoridate water are not pharmaceutical grade.** Instead, they largely come from the wet scrubbing systems of the phosphate fertilizer industry. These chemicals (90% of which are sodium fluorosilicate and fluorosilicic acid), are classified hazardous wastes contaminated with various impurities. Recent testing by the National Sanitation Foundation suggest that the levels of arsenic in these silicon fluorides are relatively high (up to 1.6 ppb after dilution into public water) and of potential concern (NSF 2000 and Wang 2000). Arsenic is a known human carcinogen for which there is no safe level. This one contaminant alone could be increasing cancer rates – and unnecessarily so.

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

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

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

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

Continued promotion of fluoridation is unscientific

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

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

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

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

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

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

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

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

More and more independent scientists oppose fluoridation

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

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

Proponents' dubious tactics

49. **Proponents usually refuse to defend fluoridation in open debate.** While pro-fluoridation officials continue to promote fluoridation with undiminished fervor, they usually refuse to defend the practice in open public debate – even when challenged to do so by organizations such as the Association for Science in the Public Interest, the American College of Toxicology, or the U.S. EPA (Bryson 2004). According to Dr. Michael Easley, a prominent lobbyist for fluoridation in the US, "Debates give the illusion that a scientific controversy exists when no credible people support the fluorophobics' view" (Easley, 1999). In light of proponents' refusal to debate this issue, Dr. Edward Groth, a Senior Scientist at Consumers Union, observed that, "the political profluoridation stance has evolved into a dogmatic, authoritarian, essentially antiscientific posture, one that discourages open debate of scientific issues" (Martin 1991).

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

Conclusion

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

Just how much doubt is needed on just one of the health concerns identified above, to override a benefit, which when quantified in the largest survey ever conducted in the US, amounts to less than one tooth surface (out of 128) in a child's mouth?

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

Postscript

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

Publication history of the 50 Reasons

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

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Top Ten Arguments Against Water Fluoridation

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

Find Out 50 MORE Reasons Against Fluoride

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

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

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

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

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