

February 2012

Summary Report

HUMAN TOXICITY, ENVIRONMENTAL IMPACT AND LEGAL IMPLICATIONS OF WATER FLUORIDATION.

Overview of the Health and Environmental Risks of Fluoride and Silicafluoride compounds requiring Priority Attention for the Safe Management of Drinking Water for Human Consumption.



EnviroManagement
SERVICES

PREPARED BY:
Declan Waugh B.Sc. C.Env. MCIWEM. MIEMA. MCIWM.



EnviroManagement Services
11 Riverview
O' Doherty's Rd
Bandon, Co. Cork

T:023-8841933
M:086-3853363
E: declan@enviro.ie
Web: www.enviro.ie

FEBRUARY 2012

Summary Report:

HUMAN TOXICITY, ENVIRONMENTAL IMPACT AND LEGAL IMPLICATIONS OF WATER FLUORIDATION.

Overview of the Health and Environmental Risks of Fluoride and Silicafluoride Compounds requiring Priority Attention for the Safe Management of Drinking Water for Human Consumption.

SUBMITTED TO:

The Government of Ireland and the European Commission

AUTHOR:

Declan Waugh B.Sc. C.Env. MCIWEM. MIEMA. MCIWM.
Chartered Environmental Manager
Chartered Environmentalist
Chartered Waste Manager
Environmental Auditor
Environmental Scientist

A copy of the full Technical Report is available to download from
www.enviro.ie/risk

Article 174 of the **TREATY OF EUROPE**
mandates
that Community policy on the environment
must contribute to the preservation,
protection and improvement of the
quality of the environment,
the protection of human health and
the prudent and rational utilisation of natural
resources based on the
**PRECAUTIONARY
PRINCIPLE.**

TABLE OF CONTENTS

Acknowledgements	1
Potential conflicts of interest	1
Limitations	1
Disclaimer	1
1.0 INTRODUCTION	5
2.0 THE MAIN FINDINGS ON HUMAN HEALTH TOXICITY AND THE ENVIRONMENTAL IMPACT OF WATER FLUORIDATION	7
2.1 HEALTH RISKS	19
2.2 ENVIRONMENTAL RISKS	23
2.3 INADEQUATE RISK ASSESSMENT	25

Acknowledgements

The Author wishes to acknowledge the comprehensive work of the committee members of the European Commission's Scientific Committee on Health and Environmental Risks (SCHER), the European Commission Directorate General for Health and Consumers who sought the review of fluoride and fluoridating agents of drinking water, the USA National Research Council (NRC) Scientific Committee on Fluoride in Drinking Water, whose members are drawn from the councils of the National Academy of Sciences, the National Academy of Engineering and the Institute of Medicine in the United States of America; the Forum for Fluoridation; Fluoride Action Network, NHS Centre for Reviews & Dissemination, University of York and Russian Academy of Sciences. There are many other data sources that the Author would like to acknowledge but the list is too extensive, it is hoped that they are appropriately referenced amongst the more than 1,200 scientific references contained within this report. A detailed list of peer-reviewed scientific publications cited in this report is provided in Appendix 1. The Author wishes to acknowledge the patience, support and assistance of Serena Corcoran BA. MA. H.Dip Education who volunteered her time to assist in editing this report without which this report would never have been finished.

The opinions of this Author present the view of an independent Environmental Scientist, a Chartered Environmental Consultant and member of the Chartered Institution of Water and Environmental Management, the Institute of Environmental Management and Assessment and the Chartered Institution of Waste Management. While the Author is a member of the Environmental Pillar for Social Partnership, this paper and the views expressed herein do not reflect the views of the Environmental Pillar of Social Partnership unless otherwise stated. Any opinions, findings, conclusions or recommendations expressed in this report are those of the Author and do not reflect the view of the organisations or agencies that provided information for this report.

In consideration of the concerns raised in this report, as documented in the extensive peer-reviewed risk assessment data examined in undertaking this study, the Author urges healthcare professionals, public health Authorities, environmental health officers, environmental scientists, occupational health and safety officers, environmentalists, elected representatives and healthcare providers to review all current information available and referenced in this study and to use this information to seek an urgent re-evaluation of current policy and practices on fluoridation.

Potential conflicts of interest

The Author has no financial interest in fluoridation or alternate treatments for public water supplies nor in any form of defluoridation. This report was undertaken voluntarily by the Author for public dissemination to support a review of the existing regulatory policy of mandatory legislation for water fluoridation based on the scientific data presented in this study. The Author received no gratuities, commission, compensation nor professional fees for preparing this report. It has been undertaken in the public interest with no financial gain. The review was undertaken for the people of Ireland, particularly to benefit consumer rights, consumer protection, the health and well-being of individuals and the environment. This review is intended for informational purposes only and is not intended to be used as a substitute for medical advice.

Limitations

EnviroManagement Services herein referred to as 'the Author' produced this report for the sole purpose of public interest and dissemination of up-to-date scientific facts and background information relating to water fluoridation, public health and the environment. At the beginning of his research the Author had no intention of writing such an extensive technical report. This report evolved both as a consequence of the alarming evidence and information reviewed as well as the lack of specific risk assessment data from which to comprehensively examine and determine the overall risks and environmental impacts associated with water fluoridation. The Author thus acknowledges that this is by no means a comprehensive synthesis of the environmental or public healthcare risks associated with water fluoridation. They are too many to report in full within the context of this report. This is a complex issue, and the Author of this report does not purport to be an expert in all the areas addressed in this report. Nevertheless, as an Environmental Scientist with over twenty years professional experience, the Author is conversant in many of the areas addressed in this report. The completion of this review was particularly challenging owing to a limited timeframe and the difficulties encountered by the Author in finding relevant scientific information and reliable evidence with which to inform existing policy. A comprehensive review of international scientific research is, however, provided in this report. It should thus help provide more detailed specific information to assist with a significant and urgent re-appraisal of current policy.

This report is a synthesis report – it synthesises the important issues around this topic: the environmental risks, the doubts surrounding the proclaimed benefits of water fluoridation, the known and potential public health risks, some of the important legislative issues that must be addressed, the scientific, medical and epidemiological research that is required and has yet to be undertaken on fluoride and fluoridation products as well as the opinions and conclusions of the Author as informed from the research undertaken. The restricted timeframe for researching this given topic denotes that there are some areas within this report that could not be specifically covered. Therefore, it was not possible to undertake a comprehensive investigation of the many and varied environmental and public health risks associated with water fluoridation. A number of areas in need of further research are identified throughout the report.

Disclaimer

Although every effort has been made to ensure the accuracy of the material contained in this publication, the conclusions and recommendations contained in this report are based upon information provided by others including peer-reviewed scientific journals and reports of international scientific committees. The Author does not accept any responsibility for loss or damage caused or claimed to have been caused, in part or in full, as a consequence of any person acting, or refraining from acting, as a result of the matter contained in this publication. No other warranty, expressed or implied, is made as to the professional advice included in this report. All or part of this publication may be reproduced provided the source is acknowledged.

A note on terminology:

Fluorine is an element in the halogen group as are chlorine and iodine. Fluorine is the most chemically active non-metallic element of all the elements and also has the most reactive electro-negative ion. Because of this extreme reactivity, fluorine is never found in nature as an un-combined element. Fluorine compounds or fluorides are listed on the Priority list of Hazardous Substances by the U.S. Agency for Toxic Substances and Disease Registry (ATSDR) as substances that pose the most significant threat to human health.

Fluoride: Any combination of fluorine with another element or chemical group of elements. Thus, the addition of fluorides to drinking water can indicate the addition of a large number of chemical agents. The most commonly used fluorides for this purpose are sodium fluoride, NaF, hydrofluorosilicic acid, H₂SiF₆, (which is the product used in Ireland), a compound that contains both fluorine and silicon. Such agents are collectively called "Fluorosilicicetes." They include fluorosilicic acid, fluorosilicicete, hydrofluosilicic acid and hexafluorosilicic acid.

Fluoride is a List ii substance under the Council Directive 80/68/EEC relating to the prevention of discharges of certain toxic, persistent and bioaccumulable substances into groundwater.

Fluoride is listed as an undesirable substance in Annex 1 of Directive 80/778/EEC relating to the quality of water intended for human consumption.

In a comprehensive hazard identification study undertaken by the U.S. EPA examining 254 pollutants that may cause adverse effects to public health and the environment involving quantitative risk assessment, including dose response evaluation, exposure assessment and risk characterisation, the pollutant fluoride was identified as one of the top twelve critical pollutants.



1.0 INTRODUCTION

The Author of this report had no fixed opinion on water fluoridation before commencing this research and originally had no intention of ever writing a report on this subject. The Author undertook this research as a concerned parent and care provider following the recommendations of scientific committees that parents should be knowledgeable about the adverse health effects of fluoride exposure on their children as well as their own individual dietary fluoride intake as a measure towards preventative healthcare. A major factor in deciding to write this report was the recommendation by the British Medical Council that more robust information on the potential harm of fluoridation is needed. The full technical report attempts to address this concern, this report summarises the findings of that report.

Following a review of the technical information provided by international scientific committees and peer-reviewed scientific journals it has become abundantly clear that the perceived benefits of fluoridation are minor compared to the acknowledged risks to public health and the environment from systemic water fluoridation. There has never been any comprehensive environmental risk assessment examining human toxicity, the environmental impact and the legal implications of water fluoridation. Many previous studies focused on one particular area, generally health and highlighted the lack of available data to prove fluoride was safe often overlooking certain scientific observations from academic scientific journals not readily accessible to the public and entirely ignoring due diligence on environmental risk assessment or legislative due diligence. There has also been some controversy regarding transparency and inadequate disclosure of scientific reporting. In an attempt to update scientific knowledge on new research findings associated with fluoride while providing a more theoretical knowledge-based approach to environmental risk management through the examination of the broader implications of water fluoridation, this report provides a more detailed review of the human health risks, environmental impacts and legal implications of water fluoridation than have been previously examined.

The Author believes that public policy should evolve with developments in science and that scientific research has demonstrated that continuation of the policy of systemic water fluoridation is no longer justifiable. It is absolutely certain that the policy of mandatory water fluoridation violates both European and International Law. Regardless of the findings of this report, in current economic times when public finances for critical healthcare, education and social policies are being cut, it is absolutely incomprehensible that funding would be provided by the Government of Ireland to continue with such an ineffective policy against the recent recommendation of the EU Scientific Committee on Health and Environmental Risks, who found that not only was the policy ineffective, but any data supporting its benefits was lacking scientific credibility. Ireland is the only country in the European Union with a mandatory legislative policy on water fluoridation. The worst that could happen if the policy ended tomorrow is that Irish citizens would have the same rights as every other European citizen to clean safe non-fluoridated drinking water.

It is particularly significant that traditionally perceived medical claims in support of water fluoridation have been disputed by international scientific committees, who were unable to find any conclusive studies to support the existing medical claims in support of fluoridation, if, in fact, such claims have ever been made in a sound scientific manner. Simply put the benefit of fluoride for dental decay has been proven to be by the application of fluoride toothpaste onto the enamel of the tooth. not by the ingestion of fluoride into the body and the interaction of fluoride in blood plasma with the developing teeth of children.

The ever-growing body of scientific literature examining the potential impact on humans and the environment of the toxic effects of fluoridation compounds are reviewed in this report. Over two hundred and twenty separate peer-reviewed scientific publications covering every aspect of medicine and environmental assessment from dental health to biochemistry, toxicology, metabolism, the blood, bone research, the brain, metabolism, epidemiology, pharmacology, neurotoxicology, molecular neurobiology, dental health and environmental toxicology have been examined and reviewed. In total over twelve hundred scientific references are provided in this report allowing the health, legal and environmental impacts to be examined in some detail alongside associated risks that have not yet been previously examined elsewhere. All of the evidence is convergent and demonstrates that fluoride compounds should not be added to public water supplies, when examined collectively the evidence clearly demonstrates that fluoridation of drinking water supplies is both unsafe and having significant negative health implications for human health, society and the natural environment. While the search for knowledge is never complete, this report usefully identifies research that should inform public policy going forward as part of our continual efforts to refine the evidence-base for policy-making. This report provides overwhelming evidence-based information to allow the State to urgently review the policy of water fluoridation. Following a comprehensive review of the most up-to-date scientifically valid information available, the inescapable conclusion reached in this study, is that the practice of water fluoridation results in the ingestion by the public, and release into the environment, of dangerous chemicals that are harmful to public health and the environment.

One central and astonishing fact that has been documented repeatedly by every assessment to date is that the products used for water fluoridation have never been tested for safety on humans nor the environment. This is both illogical and unlawful. Water Fluoridation in the Republic of Ireland is in fact a State-sponsored policy and not EU Law, nor does it support EU policy in any shape or form. As an outdated national policy it is in breach of over thirty EU Directives and policy documents in addition to international legal treaties on human rights and the environment. The potential financial, legal, healthcare, social and political impacts of such a policy are truly enormous not to mention the future damage to international public relations, tourism and food exports for Ireland if it were to continue to support such a damaging policy. In light of recent scientific findings addressed in this report continuation of the water fluoridation policy in this country could have serious implications for the health and welfare of its citizens as well as for its economy.

2.0 THE MAIN FINDINGS ON HUMAN HEALTH TOXICITY AND THE ENVIRONMENTAL IMPACT OF WATER FLUORIDATION

This investigation has been undertaken in order to update the Government of Ireland, the European Commission, their agencies and the public on recent scientific findings on the human health risks and environmental impacts of water fluoridation. The report further addresses, for the first time, the legal implications of fluoridation relating to drinking water, food safety, consumer rights and protection of natural resources.

Water is necessary not only for drinking, but also for food production and preparation, personal hygiene, care of the sick, cleaning, washing, waste disposal and care of domestic animals. Access to safe drinking water is a basic human right. It is now known that the policy of fluoridation of drinking water supplies is unsafe and places an unacceptable health burden on people and an unsustainable impact on the environment.

While the practice of fluoridation of drinking water was intended to have a beneficial effect on caries prevention and to reduce social inequalities in dental health, there is now unequivocal evidence to show that the practice is now contributing to adverse public health risks and environmental impacts. The public have always been assured that there was absolutely no possibility of any harm or risk from fluoridation of water. There is now unequivocal evidence that demonstrates that this is not the case. This report presents the scientific and medical evidence from over twelve hundred peer-reviewed scientific articles that demonstrates beyond any reasonable doubt that fluoridation of drinking water is a significant contributory factor to the negative health burden of Ireland. This report presents a summary of the published peer-reviewed health and environment related literature on fluoride and its implications for human health and biodiversity.

Research findings have demonstrated the ability of fluoride to act as an enzymatic poison in the human body inhibiting critical metabolic pathways required for healthy living. This report clearly demonstrates how inhibition of certain metabolic pathways is linked with increased neurological and cardiovascular diseases as well as dental, skeletal and mental fluorosis. Apart from bones and teeth many of the essential human organs in the body are directly affected by fluoride including the heart, kidneys, liver and pineal gland. Fluoride is now known to cause calcification in human arteries resulting in plaque formation and increased risk of stroke and heart disease. Significant calcification also occurs in the pineal gland and kidneys.

It is now known that individuals with renal disease and infants bottle-fed with formula milk reconstituted with fluoridated water are the most at risk from the impacts of fluoride. Fluoride is now known to act as a destabiliser of calcium and magnesium bonding in the human body with serious consequences for human health. Fluoride is also known to have major co-toxicity health implications when it complexes with other pollutants present in water such as

aluminium. This is known to have major health implications including neurological and chronic bone pain.

Largely as a consequence of fluoridation of drinking water, fluoride has become one of the most widely available elements that is present in artificially elevated concentrations in potable water, processed foods and drinks prepared with treated water as well as cooked foods prepared with fluoridated water. As a consequence, the daily intake and exposure of the population to fluoride is now considerably higher than that of any previous generation.

The Health (Fluoridation of Water Supplies) Act, 1960 is a public health measure in the field of preventative dentistry that legislates for fluoride or fluoride products to be added to waters to prevent disease in human beings. As with any product, the State must ensure that it has undertaken rigorous scientific examination of the health and safety risks of fluoridation products. In order to quantify the potential public health risk and economic costs of fluoridation of drinking water, in excess of fifty comprehensive epidemiology, toxicology, clinical medicine and environmental exposure assessments were identified requiring urgent assessment by international scientific committees representing the National Research Council of the United States of America and the European Commission's Scientific Committee on Health and Environmental Risks. In reality, there have been limited and incomplete studies on the health and environmental effects of exposure to fluoride. None of the peer-reviewed recommended assessments have been undertaken by the public health Authority with responsibility for water fluoridation in Ireland. This in itself is unusual since populations, especially in countries where water fluoridation is national policy, are already being exposed to this element without adequate health and safety assessments being undertaken on how they might be affected.

Within Europe Ireland remains the only remaining country with a legislative policy for fluoridation of drinking water. A policy which is mandated through national legislation that predates its membership of the European Union. The provisions of the 1960 Health (Fluoridation of Water Supplies) Act were brought into force in 1965 by a series of Statutory Instruments containing Ministerial Regulations. This 1960 Act is the primary legislation governing the fluoridation of public drinking water supplies in Ireland. There is no EU legislative provision allowing for the fluoridation of drinking water supplies. In contrast to this Act, almost every other piece of active water or environmental legislation with legal status was introduced following Ireland's entry into the European Union in 1973.

In the context of existing EU and national regulatory legislation concerning the environment, health and food, it has been found that the policy of water fluoridation contravenes thirteen EU Directives, three EU Food Regulations, four Statutory Regulatory Instruments, one EU Medical Directive, One EU Product Directive, seven international Treaties, three European Conventions and six European Action Policies totalling thirty-eight separate acts of legislation. This may indeed not be the final number but reflects the significance of the violations as examined by the Author of this report. It may

perhaps also provide a clear answer as to why no other European country accepts the position of Ireland with respect to water fluoridation.

In 2000, the NHS YORK Review, following a critical and detailed examination of water fluoridation, concluded remarkably that it was unable to identify one high-quality study to show that the practice is effective or safe.

In 2002, the British Medical Council observed that there are many detrimental impacts of water fluoridation and that more robust information on the potential harms of fluoridation is needed.

In 2003, the European Commissions Scientific Committee on Cosmetic Products and Non-Food Products (SCCNFP) intended for consumers undertook a study of the safety of fluorine compounds in oral hygiene products for children under six years of age. SCCNFP observed that systemic exposure to fluoride, resulting from fluoridation of drinking water supplies not only contaminates infant formula food but may impair normal development of enamel in the pre-eruptive tooth and cause fluorosis.

In 2006, the U.S.A. National Research Council (NRC) Scientific Committee in their comprehensive report on fluoridation, highlighted an alarming number of potentially adverse public health risks associated with water fluoridation. Furthermore, the NRC documented the growing weight of toxicological and epidemiological evidence identifying clear public health risk associated with the addition of fluoride to public drinking water supplies.

All independent scientific reviews have agreed on one important legal principle, that is that there exist both known and probable risks that can cause harm to the public and to the environment. Furthermore, all international scientific reviews have themselves independently raised concerns regarding the lack of appropriate scientific risk assessment that would demonstrate beyond reasonable doubt that no harm will result from water fluoridation.

More recently, in 2010, the European Commission's Scientific Committee on Health and Environmental Risks (SCHER) was unable to demonstrate the benefit of fluoridation of drinking water for dental health. SCHER concluded that while the scientific evidence for the protective effect of topical fluoride (toothpaste) application is strong, the respective data for systemic application via drinking water is less convincing. These findings are remarkable as they indicate quite clearly that SCHER believes that the evidence for supporting water fluoridation, despite half a century of implementation in some countries, like Ireland, is inconclusive and lacking scientific merit.

Ultimately, the Irish Government must examine the policy of water fluoridation in the context of one of the key principles of the National Health Strategy for the Republic of Ireland, that is, ensuring equity. Ensuring equity demands that health inequalities are targeted and that people are treated fairly according to their needs. The information in this report clearly demonstrates how the objective of ensuring equity cannot be maintained by continuation of the policy that specifically targets risks at the most vulnerable in our society.

Parents and care providers must be allowed to make informed choices on child-care and it is inconceivable that any parent or government would willingly allow infants under one year of age to consume multiples of the daily recommended intake of a known toxic substance by consuming infant formula food contaminated with fluoride from artificially fluoridated water. The State has a duty of care to protect the most vulnerable and to act on scientific evidence.

Equally, every consumer has a right to be fully informed of the quality of drinking water they consume and the health risks or implications of any interventions made on their behalf by the State that may impact on their health and wellbeing. European citizens are advised to be aware of their total dietary fluoride intake yet Ireland is the only country with a policy to fluoridate its public drinking water supplies. Consumers in Ireland are completely unaware of the health and environmental impacts of water fluoridation because they are not informed by the Authorities of the risks. Figure 1 (overleaf) illustrates the geographic high risk locations in Ireland for certain neurological, cardiovascular and carcinogenic diseases based on drinking water quality. The addition of fluorine compounds, particularly in these locations, acts as a trigger mechanism to increase the risk of developing such diseases by inhibiting critical metabolic processes within the human body. Fluoridation of water supplies may be regarded as an insidious poison that accumulates in the human body and environment over time. As with any poison the severity of the health problems depends on how much fluoride an individual is exposed to and at what stage in their development. In many respects, the toxicity of fluoride is similar to both lead and arsenic. As with both of these harmful substances, young children are most susceptible to fluoride poisoning. Similarly as with lead or arsenic poisoning there may be no initial signs or symptoms and it may take some time before the signs and symptoms of poisoning become manifest. Consumers are advised not to consume toothpaste as it may be fatal if swallowed. In the same manner consumers should not need to ingest fluoride with drinking water to derive its purported benefit to the surface of teeth in contact with water. All water consumed as part of the daily fluid or food intake for infants and adults includes fluoride and fluoride compounds. All water used in industry and the household for whatever purposes, including washing and sanitation, is needlessly fluoridated. This has resulted in ever-increasing quantities of fluoride accumulating not only in humans (at alarming levels -thousands of times higher than originally present in water), but also in the wider environment in rivers, soils and ecosystems where it persists indefinitely.

It is time for Irish citizens to have the same standard of care and protection as other European citizens. To this end, the Government must adopt a policy based on current scientific knowledge and harmonise its public health and water management policies with those of all other EU Member States by ending its policy of water fluoridation. It is clear, based on the information contained herein that the Health Service Executive(HSE), the Food Safety Authority (FSA), the Environmental Protection Agency(EPA), Inland Fisheries and other State Agencies and Departments must adopt a precautionary approach to risk prevention and in doing so align Ireland with every other European Member State by ending the policy of water fluoridation forthwith.

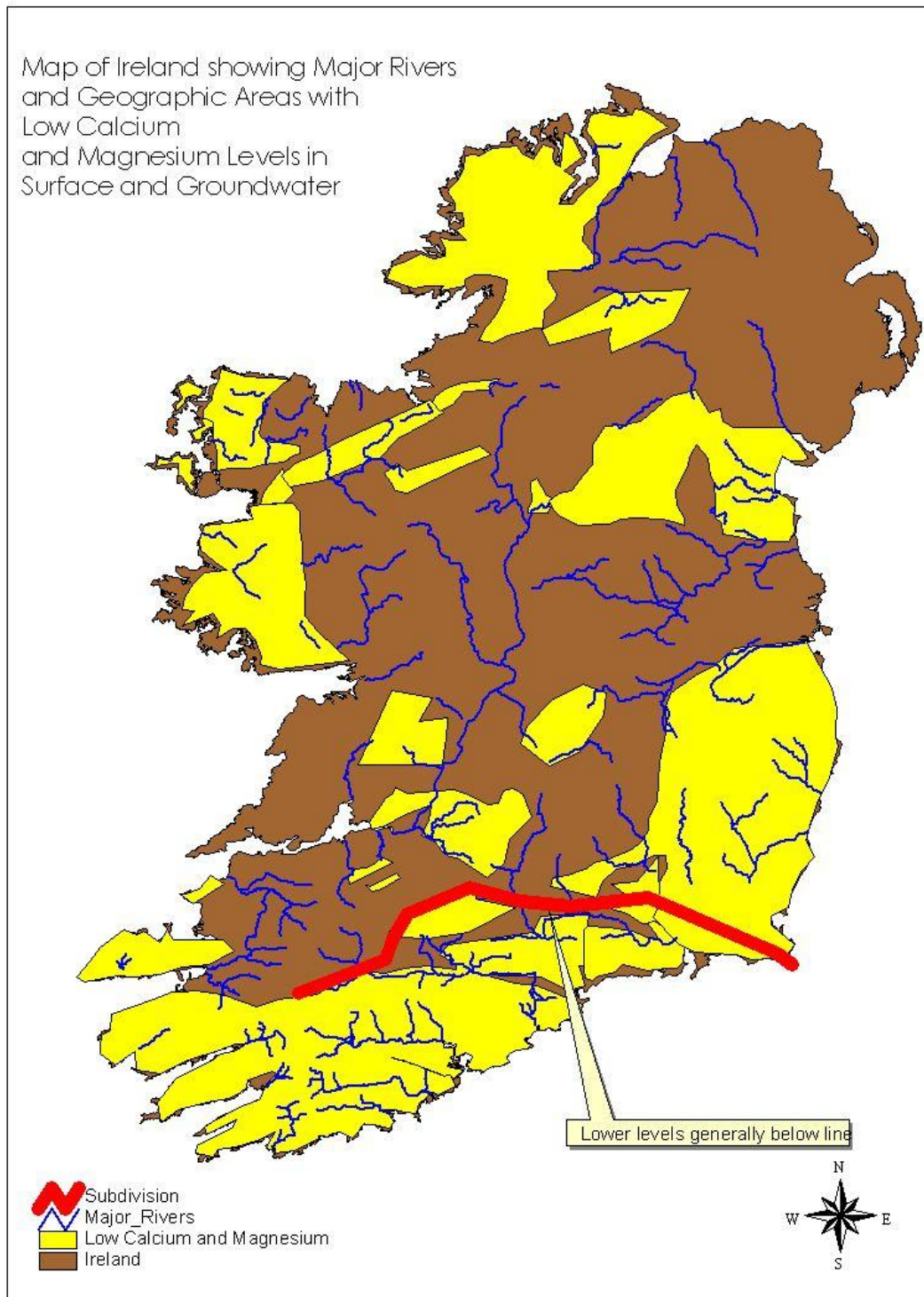


Figure 1. Vulnerable geographic locations and high risk communities to water fluoridation in Ireland. All areas identified as yellow are low calcium waters with the softest water located below red line due to geological bedrock found in County Cork and South Kerry.

It is also apparent that by ending the policy of water fluoridation, it would save the Exchequer much needed tax revenue that could be spent on critical healthcare, education, infrastructure or community and social programmes. Public finances could also be more appropriately directed to public dental health programmes for the disadvantaged. It is additionally apparent, given the alarming number of health risks and diseases resulting from exposure to fluoride, that the single biggest contribution and potential cost-saving exercise the current Government could make to support the Health Service in Ireland, while benefitting the health and welfare of its citizens, could be achieved by following the precautionary approach and ending the policy of water fluoridation.

2.1 HEALTH RISKS

The most recent investigations of fluoride and water fluoridation have documented the growing weight of toxicological and epidemiological evidence that there is a clear public health risk associated with the addition of fluoride (or fluoride substances) to public drinking water supplies. Fluoride is now known to be a risk factor in developing many of the most serious health problems prevalent in the population of Ireland. This includes neurological and cardiovascular disease, type ii diabetes, osteoporosis, hypercalcemia, sarcoidosis, skeletal fluorosis, skeletal muscular disorders and periodontal disease.

The incidence of these diseases in Ireland is far above the global average. It is reasonable to conclude that fluoridation of drinking water supplies is having both a significant negative health and economic impact on consumers and wider society. Apart from the many health risks associated with over-exposure to fluoride, it is classified as a persistent inorganic pollutant that can bioaccumulate in the environment and food chain. Fluoride in the body is retained in calcified tissue, bone and teeth as well as the pineal gland, kidney and other tissues. In blood, fluoride acts as an enzymatic poison inhibiting normal metabolic processes in the body.

The toxicity of fluoride is associated with its high chemical and biological activity. Fluoride is known for its aggressive interactivity properties and actively seeks out essential elements like calcium and magnesium interfering with their capacity to fulfil important metabolic processes in the body. It is known that the level of fluoride absorption in the body depends significantly on the presence of calcium, magnesium and aluminium. Calcium deficiency is associated with higher risk of fracture in children, certain neurodegenerative diseases, pre-term birth and low weight at birth and some types of cancer as well as cardiovascular mortality from cardiovascular, ischaemic heart and hypertensive heart disease. In addition, low calcium is associated with increased risk of sudden death. Low magnesium seems to be associated with a higher risk of motor neuronal disease, pregnancy disorders (so-called pre-eclampsia), certain cancers, hypertension, coronary vascular disease (CDV) and Type 2 diabetes.

Aluminium is a potent neurotoxic agent in humans, alarmingly it has been found that in drinking water treated with aluminium compounds the addition of

fluoride increased the amount of soluble aluminium by a factor of ten. It has been suggested that aluminium by itself may not exert toxic effects on the nervous system, but is a dangerous toxin after binding to fluoride to become an aluminium fluoride.

Fluoride induced apoptosis (cell injury death) was demonstrated in the cells from different organs and tissues including lungs, kidneys, liver, brain, pancreas thymus, endometrium, bone marrow, hair follicles, erythrocytes and leukemic cells. It has been found that fluoride is a toxic anion that stimulates cellular oxygen consumption producing highly destructive free radicals such as superoxide radicals that can damage cell membranes and lead to oxidative stress. Oxidative stress is also a common mechanism by which chemical toxicity can occur in the liver. Fluoride depletes the energy reserves and the ability of white blood cells to properly destroy foreign agents by the process of phagocytosis. Fluoride inhibits AdoHydrae and homocysteine metabolism which is linked to cardiovascular disease, atherosclerotic disease, congenital heart defects, Down Syndrome, neurodegenerative disorders including depression, schizophrenia, bi-polar disorder, epilepsy, behavioural disorders, Alzheimer's disease and carcinogenesis.

Research has recently found an inverse association between fluoride in drinking water and decreased intelligence in children. Fluoride has been found to depress melatonin synthesis in the pineal gland and induce accelerated sexual maturity in both humans and animals. Fluoride has profound effects on the skeleton. It has been found to cause decreased cortical bone mineral density, poor bone quality, increased skeletal fragility, osteomalacia, rickets, periodontal disease, osteoporosis, osteoporotic hip fractures and is positively associated with rheumatoid arthritis, bone pain and proximal myopathy (neuromuscular disease resulting in muscle weakness).

A body of scientific evidence indicates that fluoride intake from fluoridation of drinking water supplies exposes a significant sector of the population to unnecessary health risks; in particular bottle-fed babies, young boys (pre-adolescent boys who drink fluoridated water are at a seven-fold increased risk of osteosarcoma) patients with renal impairments, individuals with diabetes, individuals at risk of bone fractures or bone development problems, individuals with sensitive gastrointestinal systems and individuals who are immunocompromised and who could be at greater risk of the immunologic effects of fluoride, individuals with Alzheimer's disease or dementia and children with special healthcare needs who have a developmental, mental, sensory, behavioural, cognitive or emotional impairment related to neurological development disorders.

Given the disturbing findings regarding the neurotoxicity of fluoride, it is not beyond consideration that Ireland, regarded by many as the most fluoridated country in the world (over 78% of the population consume fluoride in drinking water), may therefore show an association with increased neurological disorders. It is accepted that Ireland has one of the highest incidences of neurological disorders in the world, including epilepsy, as well as cardiovascular disease and dental fluorosis. In addition, alarmingly, it is estimated that 300,000 people in Ireland over the age of 50 have osteoporosis and sadly that over 500

patients die each year in Ireland from complications resulting from osteoporotic hip fractures.

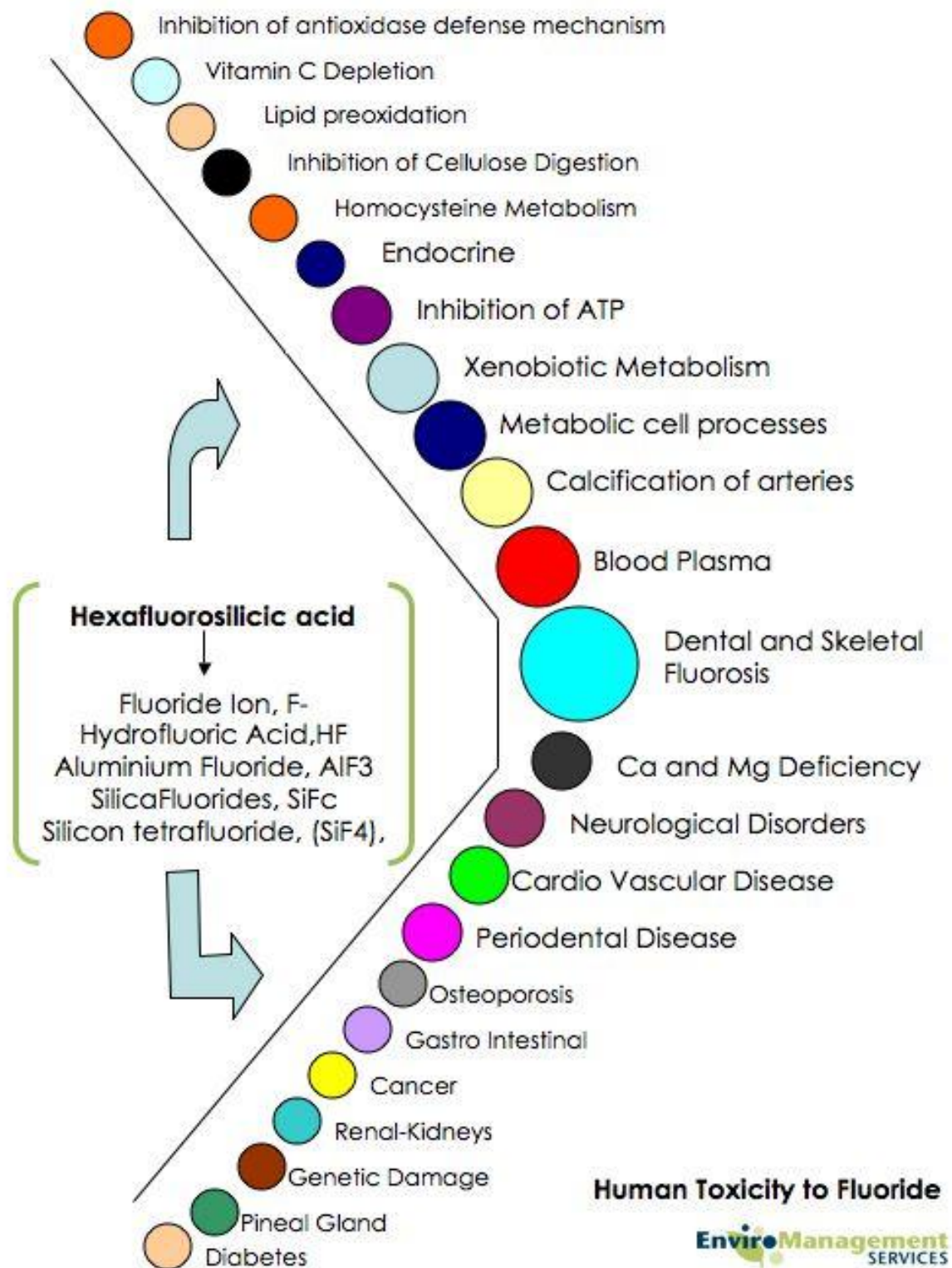
In the past, serious environmental health problems have arisen whenever the efficacy and safety of chemical agents have not been comprehensively studied before their introduction. It is precisely because of this that both researchers and regulators have adopted the "precautionary principle". Effective management of the health system and environment requires society to continuously review scientific understanding of risks and cost benefits of Government policy. In the absence of proper studies into the efficacy and safety of water fluoridation, the following question must be asked; is it acceptable for the Government of Ireland to continue to conduct what amounts to an uncontrolled experiment on its own people?

The professional approach to risk assessment in toxicology and the environment is to identify the high risk groups in the community and to set safety standards for daily doses with sufficient margin to protect them with a high degree of certainty. For such purposes the adequate intake of fluoride for infants aged from 0 to 6 months as defined by the Food and Nutrition Board (FNB) in the Institute of Medicine of the U.S. National Academies is 0.01mg/l. It is an absolute certainty that all bottle-fed infants (>55,500 infants) under 6 months of age using formula reconstituted from fluoridated water would exceed this recommended level by multiples of 6-10.

This represents a serious breach of the most basic fundamental right of citizens of Europe, as mandated in the Charter for Fundamental Rights which demand that Member states ensure a high level of consumer protection and in particular the rights of children to protection and adequate care.

It is perhaps unsurprising that upwards of 400,000 children under 18 years of age (40%) are known to have dental fluorosis, demonstrating a chronic over-exposure to fluoride in the wider population. At the most basic bio-monitoring level, this demonstrates that fluoride added to water, so that it may make contact with teeth in an attempt to reduce the incidence of dental disease, increases the concentration of fluoride in blood plasma to a level so high that it causes visible physical structural damage to teeth. It is absolutely nonsensical to suggest that the only negative impact of water fluoridation to humans is dental fluorosis.

While the incidence of dental fluorosis is extraordinarily high in children and young adults in Ireland, even more alarming is the fact that over the period of time that water fluoridation has been practised in the Republic of Ireland approximately 75% of individuals born in the country whom are alive today and under the age of 50 (which represents the largest population group in Ireland), and who were bottle-fed as infants, would have been exposed to even higher levels of fluoride in drinking water. While the health implications of this for society have never been properly examined many are addressed in this report. The principal health risks are illustrated in Figure 2.



It is consequently a very serious and alarming development to observe that up to 8.1% of the water samples taken from public group water schemes are reported to have exceeded the legal standard for fluoride, a level that is coincidentally twice the recommended concentration for drinking water in either Ireland or the U.S.A. The most recent EPA report noted that one public water supply of 51 exceeded the fluoride standard of 1.5mg/L in 2010 while the SCHER review reported that levels in Ireland in excess of 5mg/l have been documented. No details are provided for the location of the water supply, the period for which these exceedances occurred nor the population numbers at risk from the chronic fluoride exposure as a consequence of the reported exceedances.

Astonishingly, it has also been reported by the EPA that the population are regularly exposed to extremely high concentrations of this toxin due to repeated accidental releases as a consequence of persistent operator errors at water treatment facilities. The health or environmental implications of these incidences have never been examined or reported.

As an environmental health policy, it is remarkable that approximately only half of one % of the fluoride added to drinking water ends up being used for the purpose it was intended. In total approximately 99.45%¹ of the fluoridated water is not used for the purpose for which the policy is undertaken, in effect this singularly represents one of the most ineffective health policies of any country globally.

This report also highlights how the policy of water fluoridation in Ireland has acted as a continuous source of fluoride pollution of the environment over the past four decades, releasing approximately 78,400,000kgs of fluoride into the environment through wastewater effluent directly discharged into rivers and treated wastewater sludge disposed of onto agricultural land.

2.2 ENVIRONMENTAL RISKS

In addition to the health risks of fluoride, it is acknowledged on the material safety data sheet for the product used for fluoridation that the substance is also harmful to aquatic ecosystems in low concentrations. Fluorides released into the environment as a consequence of water fluoridation act as persistent pollutants that accumulate in the aquatic and terrestrial environment. Fluoride is classified as a persistent inorganic pollutant that will bioaccumulate within the environment and food chain; the policy of water fluoridation in Ireland has resulted in the indirect release of significant quantities of fluoride into soils, groundwater and surface waters in significant concentrations with little or no controls.

Fluoride added to drinking water enters the freshwater ecosystem directly from multiple point source emissions and from surface run-off. Surface run-off from fire-fighting, washing cars and watering gardens may enter streams directly or through storm sewers at optimal concentration. Most fluoride enters from point sources, such as wastewater treatment plants, and from leakage in drinking

water infrastructure. To my knowledge, no comprehensive environmental impact assessment has ever been undertaken examining the potential impact on surface water ecosystems of fluoride in wastewater discharges. Nor to my knowledge have any field studies ever been undertaken to examine the effect of fluoride on salmon or other freshwater species in Ireland.

The Irish EPA have documented that potential waters at risk from fluoride pollutant include receiving waters located downstream of drinking- and wastewater treatment plants and areas where there is significant leakage from the drinking water distribution system. The agency further reported a number of exceedances of the standard for fluoride associated with the infiltration of drinking water into surface waters as well as leaking drinking water distribution mains into groundwater aquifers, which the agency regarded as a significant potential source of fluoride.

It is known that as a water pollutant, elevated concentrations of fluoride may affect a number of organisms; including fish, amphibians, insects, snails, shellfish, protozoa and some aquatic plants. It has also been documented that fluoride is an endocrine disruptor in the freshwater environment. If behaviour-altering pollutants such as fluoride are present in critical concentrations, it is likely that the migrating adult salmonids would respond to them in a short timeframe. Serious hazards to fish could arise through unperceived or unavoidable low level pollutants, in particular altering predator or food detection, reproduction or migration.

It is considered that the affects of fluoride emissions would be most pronounced in soft waters representative of the best salmonid rivers of Ireland. One must consider that with over 240 water fluoridation plants located in every water catchment area within the country and over 478 wastewater treatment plants discharging fluoride into freshwater, estuarine and coastal waters that the potential ecological impact over time may be enormous. This is especially so when it is known that over 78,400,000kgs of fluoride have been discharged into the environment from these facilities since fluoridation of water commenced in Ireland.

Fluorides are known to be toxic to trout and other fish, in particular smolting juvenile salmon. It is very worrying therefore to note that anthropogenic fluoride emissions are discharged from wastewater treatment plants into some one hundred and forty eight salmon rivers across the Republic of Ireland. While other factors also have contributed to the decline in freshwater salmon populations in Ireland, it is remarkable how the start of the decline in stocks mirrors exactly the commencement of water fluoridation in Ireland.

Apart from fisheries it also known that fluoride can either inhibit or enhance the population growth of algae, depending upon fluoride concentration, exposure time and algal species. It is also known that fluoride has a strong binding potential to sediments in rivers. Additional research has demonstrated that fluoride released into marine environments has been shown to accumulate in aquatic organisms.

Fluoride is also a pollutant that is present in sewage sludge and processed waterwater sludge where fluoridated waste has been used in the manufacturing process. Sewage and processed sludge has been and continues to be applied to land in Ireland. While the State has an obligation to protect public health and the environment from the anticipated adverse effects of this pollutant on the environment, inadequate research has been undertaken to examine the potential impact of this pollutant on groundwater, surface waters and human health in Ireland.

The U.S. EPA undertook a hazard identification study of pollutants that may cause adverse effects to public health and the environment. Based on the results of this study a list of 254 pollutants were identified and of these 31 were then evaluated in a comprehensive hazard identification study. In their study, a quantitative risk assessment, including dose response evaluation, exposure assessment and risk characterisation, was performed. The goal was to identify pollutants that may potentially cause human health or ecological risks for a highly-exposed individual. Only pollutants that were deemed to be of risk to human health based on available human and ecological toxicity data were examined. Based on the results of the risk assessment and hazard identification, twelve pollutants were found to have critical exposure pathways for humans. Fluoride was identified as one of the principal pollutants.

This finding is particularly concerning for a small island nation such as Ireland where agricultural land is limited and food production is a significant part of the economy. The EPA in Ireland have documented that over 120,000tonnes tonnes of dried sludge is produced nationally from wastewater treatment plants annually, of which approximately eighty % is used for agriculture.

The concentration of fluoride is not measured in sewage sludge disposed of or re-used in agriculture in Ireland and despite the alarming findings of the U.S. EPA no risk assessment on the impact of fluorides on food production and human health has ever been undertaken in Ireland.

2.3 INADEQUATE RISK ASSESSMENT

While it is accepted that the toxicology of hexafluorosilicic acid and hexafluorosilicic compounds used to fluoridate drinking waters are incompletely investigated and that additional epidemiology, toxicology, clinical medicine and environmental exposure assessments need to be undertaken in order to fill data gaps in the hazard profile, the health effects and the exposure assessment of fluoride; the Government of Ireland continues to support the policy of fluoridation in the absence of any scientific data to demonstrate that the practice is safe or effective.

The State is required, for the protection of public health, to undertake detailed risk assessment and clinical trials including comprehensive toxicological and pharmacological tests to demonstrate the effectiveness and risks associated with fluoridation of water. Despite a legal requirement, no such toxicological or

pharmacological tests on the products used for water fluoridation have been undertaken by the State or its agencies.

Common sense should suffice in preventing unnecessary risk to consumers, yet the ongoing systematic fluoridation of public water supplies without proof of safety poses extraordinarily inherent dangers for the public. In effect the State is conducting unmonitored clinical trials of a known toxin on an entire population over an extended period of time without their knowledge or consent. Naturally, if any unwelcome side-effects occur they are likely to be felt by tens of thousands of people, both young and old. While the policy of water fluoridation continues in Ireland it is politically, morally and ethically unacceptable that the public and ultimate consumers of drinking water still await the commencement of comprehensive epidemiology, toxicology, clinical medicine and environmental exposure assessments. This is entirely unacceptable.

There is an obligation by public health services to assess whether adequate information on the safety of fluoridation products is available. Where adequate information is not available (as is the situation), the State is required legally to enact the precautionary principle as defined in European law and international treaties.

The Authorities should be aware that the WHO has recommended that where the risk for skeletal and dental fluorosis is high (as is the case for Ireland with approximately forty % of the population known to suffer from dental fluorosis), fluoride levels in drinking water should be reduced to safe levels, or a lower fluoride source used, especially for young children.

Parents and households in Ireland do not have access to non-fluoridated public water supplies to prepare infant formula or foodstuffs. The Government of Ireland intends to introduce a household charge and a water service charge for all households. Notwithstanding the numerous violations in EU law resulting from fluoridation of drinking water the Government of Ireland has a moral and legal obligation to provide non-fluoridated water to households in the interests of public health and safety, otherwise it is inconceivable that the State would charge households for the safe supply of drinking water.

As part of the provision of 'safe' drinking water, it is particularly disturbing that despite the numerous health concerns regarding systemic exposure of the population to silicofluorides in drinking water, no risk assessment has ever been undertaken on the commercial grades of silicofluorides used in water treatment in Ireland. Alarming this lack of accurate scientific information on risk assessments has been noted in all scientific reviews of fluoridation. The question must then be asked as to how the policy of water fluoridation can continue without accountability and proper review?

The Government of Ireland has ratified international treaties upholding the precautionary principle for environmental risk management. The precautionary principle forms the basis of both European law and international treaties. It must be upheld particularly when the general health and wellbeing, both mentally and physically, of an entire nation's population may be unwittingly at risk from exposure to a known toxin that is added to public water supplies. The

information contained in this report is taken from respected, verifiable and reliable peer-reviewed scientific journals of international standing and must be acknowledged and immediately acted upon to protect the public interest, above all else the health and safety of the public.

Given the scientific evidence presented in this report the government of Ireland or its agencies cannot ethically or morally continue to support a policy that is lacking so clearly in intelligence, judgement and professional due diligence. To continue to support such a policy, in light of the information contained in this report, would represent gross culpable negligence.

Even the most rational person would agree that, given the potential risks and potent health hazards associated with water fluoridation, the small likelihood of any perceived benefit cannot be used as a basis for placing the entire population at risk to compounds that have not been thoroughly tested for their toxicity in humans.

Currently, despite the numerous recommendations from scientific bodies that efforts be made to determine the toxicity of fluoride and silicaf fluoride products, there is no information available on the mutagenic, teratogenic, developmental toxicity, cytotoxicity, carcinogenic effects, cogenotoxicity, short-term and sub-chronic exposures or synergistic/antagonistic effects of fluoride or Hexafluorosilicic acid on human beings.

Clearly therefore the only sensible, pragmatic, scientific, moral and legal approach is to end the policy of water fluoridation immediately.

Failure to do so, in light of the findings in this report, would represent a gross failure of responsibility and political leadership.

A copy of the full report is available to download from
www.enviro.ie/risk

