

Waverley and Patea Town Water Supply Fluoride Submission to the South Taranaki District Council

“Is there something in the water?”

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9th September 2012

www.drblayney.com/Blayney-Fluoride.pdf

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A. Purpose of Submission:

Judging from the number and nature of submissions to the STDC Draft Annual Plan 2012 on Fluoridation as well as the experience of the New Plymouth and Stratford District Councils, I believe the councillors of the STDC can be assisted by my particular training, qualifications and experience in making sense of apparently conflicting “scientific” evidence.

I intend to explain the accepted scientific method used by scientists, in particular medical (and most dental) practitioners to sort out what the research is telling us, in order to practise evidence based medicine. The STDC will then be able to answer the questions of effectiveness and safety of fluoridation of community water in Patea and Waverley (and the rest of the district) and make an evidence based decision on the science. Additionally, I will address each “worrying” issue raised by those opposed to fluoridation in order to remove any reasonable doubt about safety and effectiveness that unsubstantiated claims could have raised.

The STDC must also weigh up social, moral and ethical issues, but these cannot be adequately addressed when the debate has suffered from an excess of emotion and non-scientific or pseudo-scientific input. One doesn’t decide on such an important issue based on an anti-fluoridation billboard slogan such as “**Water fluoridation is safe. Yeah Right.**” Furthermore, it has been observed by the National Fluoride Information Service that in New Plymouth, “Fluoride Action Network NZ’s coordinated approach using multiple copies of the same submission [but with different speakers delivering sections of the same submission] may have overwhelmed Councillors’ abilities to view the weight of evidence objectively.” ⁴⁵

B. Personal Background:

I am a Vocationally Registered (i.e. “specialist” or “consultant”) General (Medical) Practitioner (GP) with the following science based tertiary qualifications:

- Advanced Certificate in Principles and Practice of Radiochemistry 1972 (Auckland University)
- Bachelor of Science in Human Biology (BSc) 1975 (Auckland University)
- Bachelor of Medicine, Bachelor of Surgery (MBChB) 1978 (Auckland University)
- Diploma in Obstetrics (Dip Obst) 1980 (Auckland University)
- Fellow of the Royal New Zealand College of General Practitioners (FRNZCGP) 1998

Although I was born and raised in Auckland, I have worked in a private General Practice in South Taranaki for 32 years as well as working as a part-time Medical Officer at Hāwera Hospital for 10 years and a part-time Medical Officer for the Family Planning Association for 6 years. I have also practised as a GP-Obstetrician (GPO) for 32 years. I am the South Taranaki GP Peer Review Co-ordinator and a NZMC Supervisor for Provisionally Registered doctors working in South Taranaki. During the prior 32 years, particularly as a GPO (and also as a Medical Officer), I have often been involved in healthcare for residents of Patea and Waverley, including seeing the general health consequences of poor dental health.

For the last 22 years I have been self employed in exclusive private practice and to this day remain independent of any Primary Health Organisation (PHO) or other controlling body, being wholly responsible to my patients while being committed to evidence based medical practice as a member of the New Zealand Medical Association (NZMA) and a Fellow of the Royal New Zealand College of General Practitioners (RNZCGP). This means I am the only local General Practitioner able to speak openly and honestly without the permission of non-medical employers, or PHO / DHB management.

My three sons were raised and educated in South Taranaki and I am married to a South Taranaki Legal Executive / Practice Manager. I have served on Boards of Governors and Trustees (Hāwera High and Intermediate Schools) as well as various advisory committees supporting the retention of health services in South Taranaki. My record on these various groups for supporting what is best for the health needs of the South Taranaki population stands unquestioned, even if it has resulted in a lower income and a lack of popularity among the management of the Taranaki District Health Board.

C. Background to Fluoridation:

Fluoridation of drinking water is recommended by most national health bodies to help prevent or reduce dental caries (decay) and is used in Hāwera and all major centres over 30,000 people except Whangārei, Tauranga, Whanganui, Napier, Nelson, Blenheim, Christchurch and now New Plymouth. It is estimated that in 2006 2.2 million people in New Zealand have fluoridated drinking water, and for 99.9%, this was under the Maximum Acceptable value of 1.5mg/L (Ministry of Health 2005). There are reasons for aiming for the recommended 0.7-1mg/L range which will be discussed in the RISK section below. Fluoridation, it will be argued, is particularly important for low socioeconomic areas like the southern part of South Taranaki where the ability for adults to access and afford dental

care is limited leading to poor dental and overall general health. The use of fluoride has changed the dental health for millions of New Zealanders including my children and most of my patients from the common full dental clearance in early middle age of my parents' generation who had poor access to dental services and fluoride, the mouth full of fillings for my generation (with school dental nurses and easier access to dentists, but still no fluoride), to my children and grandchildren who have been exposed to fluoridated drinking water and as a consequence don't need fillings and the only dental care they seem to need is cosmetic orthodontics!

Māori and low socio-economic non-Māori not only experience worse dental caries ⁷¹, and have less access to, and less ability to afford professional dental care but make up a greater proportion of the population living outside the fluoridated Hāwera water supply than those within. Extending community water fluoridation to Patea and Waverley (and perhaps other towns like Manaia, Eltham and Ōpunake) will help reduce inequalities in oral health between Māori and non-Māori ⁷¹.

Hāwera's water has been fluoridated for approximately 40 years without any evidence of the supposed increased cancer, hip fractures, arthritis or reduced IQ, (with some notable exceptions), compared to the non-flouridated parts of the district. In fact, our children seem to be much smarter than most! The title of the Ronald Hugh Morrieson Literary Awards book "**Is There Something in the Water?**" ⁴⁹ was a reference at least two judges made about the very high standard of writing seen in Hāwera (and districts) which seem inconsistent with the emotive claim that our kid's IQ is being affected by fluoridation. However, broad observations like this are not sufficient to make a logical decision.

In order for the STDC to make an informed decision on the fluoridation issue, we need to ask (and answer) the simple question – *Does the benefit to the population of fluoridating the water outweigh the risk?*

There have been many studies on this subject, of various size, quality and scientific validity. The media love to report studies that seem to go against current practise - "pill causes cancer" or raise treatment hopes – "a cure for cancer", or provide answers to the "origin of our universe", as do religious, political and special interest groups who select only what seems to agree with their beliefs. At present, there is a strong anti-fluoridation lobby from a well organized group who are making a number of worrying claims concerning the safety and effectiveness of fluoridation which has persuaded at least the New Plymouth District Council, but not the Stratford District Council to end fluoridation. We clearly need tools to help determine what is factual and isn't, in order to make logical decisions.

D. Evidence Reliability:

In orthodox medicine, we are committed to the scientific "**evidence based**" approach and get around this overload of conflicting claims by having studies made subject to peer review as well as using independent systematic reviews of these studies by respected independent scientific groups applying the best techniques to determine the level of proof the current evidence provides. Evidence Based Medicine is defined as "the conscientious, explicit and judicious use of current best

evidence in making decisions [for patients]”. Formal “Levels of Evidence” have been established to grade evidence according to its strength. Systematic reviews [see **Appendix 1a**] and Blinded Randomized Controlled Trials (RCT) represent the highest levels of evidence (Level I), whereas case reports (Level IV) and expert opinion (Level V) are the lowest. Non-expert opinion is not considered scientific evidence but obviously needs to be noted by the STDC. Recommendations by reviewers are often Graded A (consistent Level I studies) through to D (Level 5 evidence or inconsistent / inconclusive studies) ¹.

In general, it is unrealistic for a study designed and carried out in the 1950s-1970s to meet the methodological standards we expect today. Studies published in non-peer reviewed books, journals and websites while seemingly valid, are unlikely to have much strength of evidence. I have found time and again that following a claimed “recent groundbreaking study” type reference eventually peters out into an old, poorly controlled or misinterpreted observational study or animal research on megadoses of fluoride.

The scientific groups performing the reviews and making recommendations include the UK **National Health Service (NHS) Centre for Reviews and Dissemination** (University of York), the US **National Academy of Sciences**, and its **National Research Council** (NRC), also their **Centres for Disease Control and Prevention** (CDC); the Australian **National Health and Medical Research Council** (NHMRC); the **New Zealand Public Health Advisory Committee** (PHAC) and **Environmental and Research Ltd** (ESR); internationally, we have the **World Health Organisation** (WHO) and the **Cochrane Collaboration**². The most respected totally non-government international review group is this **Cochrane Collaboration**, an international network (named after Archie Cochrane) of more than 28,000 scientists, statisticians, epidemiologists, etc who review all published evidence of a subject, examine the quality and reliability of the studies, collate the evidence and then produce a statement on what the current evidence is telling us to enable us to make evidence based decisions.

The “hierarchy” of evidence is dependent on the issue being researched but in the case of fluoridation the questions are **Does this intervention help? What are the COMMON and RARE harms? Hence**, the hierarchy of studies for obtaining evidence, based on the latest Oxford 2011 Levels of Evidence Working Group ¹ and the Australian NHMRC ⁴⁸ (the subsets of III) would be:

Level	Description of Level of Evidence (LOE) – Evidence obtained from:
I	Systematic reviews of all relevant randomized controlled trials (RCTs). [Note that reviews look at the quality of any reported study, including ethics, funding, conflicts of interest, authenticity etc as well as the design and statistical significance.]
II	Non randomized and controlled observational studies (cohort and case control studies). Non-randomized follow-up Study.
III	Randomised controlled trial or observational study with dramatic effect.
III-1	Well designed “pseudo”-RCT eg alternate allocation
III-2	Non randomised comparative studies (including systematic reviews of such), Controlled cohort, case-control, or interrupted time series studies.
III-3	Comparative studies with historical control, two or more single arm studies, or interrupted time series without a parallel control group.
IV	Uncontrolled observational studies - case reports/series.
V	Mechanism-based reasoning.

Other groups such as the US Centre for Evidence-Based Medicine (CEBM) use a slightly different table to identify the different levels of evidence [see **Appendix 1b**]:

Recommendations for decisions can now be graded:

Grades of Recommendation		
A	= Recommendation	Consistent level 1 studies
B	= Provisional recommendation	Consistent level 2 or 3 studies or extrapolations from level 1 studies
C	= Consensus opinion	Level 4 studies or extrapolations from level 2 or 3 studies
D	= No current recommendation	Level 5 evidence or troublingly inconsistent or inconclusive studies

In the rest of this submission I will, where appropriate, give the “**Level of Evidence**” in the format of **{LOE=n}**, where “n”=I through V (Roman numerals), or if using the CEBM or NHMRC systems the “n” may have an Arabic subgroup as in **{LOE=III-2}** and “**Grades of Recommendation**”, if given, will be in the format of **{? Grade Rec}** where “?”= letter A through D and “Rec”= Recommendation.

Opposing this solid scientific evidenced based approach we have the anti-fluoridation groups such as Fluoride Action Network (FANNZ) ³ and Fluoridation-free NZ Coalition ⁴, who raise objections based on emotion and personal rights, which do need to be added to the equation but also raise objections based on “scientific evidence”. Their “science” based objections in general are not credible and would obtain a Grade D recommendation ie **{D Grade Rec}**. I have attempted to follow every reference provided by both the Fluoride Action Network and Fluoridation-free NZ Coalition and find that either they don’t exist (no link or bad Internet link – something that can happen as web sites change), refer to outdated, “alternative” or non-scientific sources (many are just opinions, not the peer reviewed, controlled research science is based on) or are references to themselves, each other or other anti-fluoridation groups such as the International Society for Fluoride Research. Journals frequently cited include:

The oft quoted journal “*Fluoride*” edited by John Colquhoun is actually the *Journal of the International Society for Fluoride Research Inc.* an anti-fluoridationist group. “*Science of the Total Environment*” is a journal specifically for publishing alternative material on the “changes in the natural levels and distribution of chemical elements and their compounds that may affect the well-being of the living world, or represent a threat to human health”. The “*Journal of Endemiology*” is in fact the “Chinese *Journal of Endemiology*” re-published in *Fluoride*.

All references given by FANNZ and the Fluoridation-free Coalition to highly respected, peer reviewed and evidence based journals such as *The Lancet* (the world’s leading general medical journal), *JAMA* (*Journal of the American Medical Association*) and *NEJM* (*New England Journal of Medicine*) have been followed to source by me and reveal some are opinion, some state what is already known but not relevant to the debate (such as studies that reveal high levels of Fluoride are toxic, which is not denied), but actual studies on exposure to fluoridated water (average 1mg/L Fluoride) in these particular journals consistently show “no association” (of the risk) with exposure.

E. Qualifications to interpret evidence:

I have listed my qualifications, which include a BSc in Human Biology (majoring in Statistics and Behavioural Science) as well as all my post-graduate Degree, Diploma and Fellowship qualifications. My occupation as stated, is a Vocationally Registered consultant General Practitioner, a job which requires ongoing assessment of the latest medical evidence in order to practise true “Evidence Based Medicine” and requires a three yearly cycle of re-accreditation to stay up-to-date and maintain my Vocational Registration. [Note that Fellowship of a Medical College is a specialist qualification but as “Specialist General Practitioner” is an oxymoron, it tends to be left out or replaced by the term “consultant GP”].

Furthermore, I am self-employed and under no obligation to support any organizational stance or dogma, other than my Hippocratic Oath (re-branded as “Declaration of Professional Dedication” by the Auckland University Faculty of Medicine) to ***“ever have in mind the care of the sick and the wellbeing of the healthy”***⁶⁴, so essentially I am a source of truly unbiased expert information! All the scientific groups mentioned providing Systematic Reviews involve highly qualified scientists, physicians and dentists also dedicated to evidence based truth and professional integrity.

However the scientific, (chemical, toxicological, medical or dental) qualifications of most FANNZ members are either non-existent or not stated. Their committee has one “MD” (not a NZ qualification), which was changed in the FANNZ’s Stratford submission to “MB BS” (also not a NZ qualification) who is **not** registered with the Medical Council of New Zealand (MCNZ)⁵ and one dentist with a BDS (1974 Otago) who is registered in General Dental Practice in New Zealand⁶. The Local Area / Campaign contacts all list no qualifications, and we know some hold strong “anti-science”, misinformed and illogical views. See **Appendix 3** for more comments on “Local FANNZ”.

F. Pseudo-science and misinformation:

Aside from the repeated quoting of studies that either don’t exist (eg **“studies show”**, without references), or have very low levels of evidence, I find it quite alarming to see the spread of misinformation by the anti-fluoridation lobby using deliberate misrepresentation, misquoting, selective quoting or just leaving out conclusions that fluoridation is in fact safe and effective [See **Appendix 4**]. The claim by fluoridation opponents that **“fluoridation is an issue where the scientific method and principles are being set aside by public health authorities”**¹⁰ is extremely ironic as nowhere else is the scientific approach more blatantly flouted than within anti-fluoridation literature¹¹.

In a 2007 critique of antifluoridation literature titled ***“When public action undermines public health: a critical examination of antifluoridationist literature”***, the **Australian Research Centre for Population Oral Health** describes tactics used by anti-fluoridation organisations¹¹. These include:

Denying the proven benefits of water fluoridation, Selective reporting of studies, Selective reporting of results, Downplaying or ignoring the evidence, Using ecological comparisons, Fear mongering, Misrepresentation of the truth, using “The big lie”, Half-truths, Innuendo, Follow the leader, claiming Enforced medication, Bamboozling with science, Moving the goalposts, Paranoia, conspiracy theories and extremism. These are expanded (with my editing) in **Appendix 4**

G.

Emotive appeal vs scientific evidence:

It is easy to be misled when emotive words and “half-truths” or untruths are used. The anti-fluoridation campaign uses emotive terms and phrases such as “**Hydrofluorosilicic Acid is a toxic waste product, unlike 'natural fluoride' such as calcium fluoride**” [I will quote anti-fluoride claims like this in a blue “Comic-Sans” font]

“Fluoride is toxic”: Of course it is, but not at the levels in our drinking water. There are references to the toxic effect of fluoride at high concentration, but that is not the debate, it is whether fluoride is safe and effective at the concentrations to be used in the drinking water. One is far more likely to become unwell or even die from drinking the dihydrogen monoxide ³⁹ distributed by the STDC than the hydrofluorosilicic acid at a concentration of 1 part per million.

The Data Safety Sheet from Orica New Zealand Limited where Hāwera’s hydrofluorosilicic acid is sourced uses the name **FLUROSILICIC ACID** [aka hexafluorosilicic acid, dihydrogen hexafluorosilicate, fluorosilicic acid, fluosilicic acid, silicofluoride, (hydro)silicofluoric acid, silicofluoride, silicon hexafluoride dihydride, silicic acid, sand acid and of course, **hydrofluorosilic acid (HFA)**]. While the oral LD50 (the dose where 50% of people would die) is given anywhere from 70-430mg/kg for different laboratory animals, **Haneke and Carson** in their Review of Toxicological Literature 2001³⁶ state: “A probable oral lethal dose of 50-500 mg/kg [of fluorosilicic acid], classified as very toxic, has been reported for a 150-pound (70-kg) person”. I will therefore use the **LD_{Lo}** (Lethal Dose, low) of 50mg/L – well I won’t actually use it, I’ll just talk about it! [see **Appendix 2**]

So given a LD_{Lo} of 50mg/kg, a 70kg person could possibly die after ingesting 50x70=3,500mg of hydrofluosilicic acid (HFA). The amount of fluoride in HFA (H₂SiF₆) is 79% [6 x19 (AW of F) divided by 144.1 (MW of H₂SiF₆) x 100] so our subject needs 2,450mg of Fluoride to get a potentially lethal dose. To obtain this from fluoridated water containing 1ppm (= 1mg/L under standard conditions), one would need to drink 2,450 litres of water at one sitting. Guess what, the LD50 for water is 90,000mg/kg = 90g/kg = 6.3 litres for a 70kg person. {This is about right as the British actor Anthony Andrews drank 8 litres in one day which is 90g/k if he was 89Kg and was unconscious in hospital for 3 days ³⁸}, so one would be dead 389 times over from water intoxication before one could reach the lowest possible lethal estimate of 50mg/kg for fluoride by drinking water containing 1 ppm fluoride.

Therefore a 70kg human would have to drink 2,450 litres of water (a tad over the lethal dose of 6.3 L) to obtain a Fluoride dose of 50mg/kg. The Ministry of Health calculates that one would need to drink “over 5,000 glasses of fluoridated water at one time” (=1,185 L for a 237ml glass or 2,500 L for a 500ml beer mug, so I guess they like their beer at the MoH). **Basically, it means that it is impossible for a 70kg adult to experience acute fluoride toxicity from drinking-water optimally fluoridated at levels of 0.7 to 1 ppm.**

Comparing the LD50 to other foods such as caffeine with an LD50 of 130mg/kg, a 70kg person having 130mg caffeine in a standard brew would need to drink 70 cups = 16.6L to get this dose, only 2-3 times the LD50 for water (c.f. 389x for fluoride from fluoridated water), which is reassuring for me.

However, children may be more at risk. Since 1978, there have been four fatalities caused by the ingestion of fluoride, all in dental products. Based on a review of the doses involved in the four fatalities, three of which involved young children, one writer (Whitford, 1992) estimated the

"probably toxic dose" of fluoride at only 5 mg F/kg body weight ⁴⁶. So even using this much lower (more toxic) LD₅₀ estimate of only 5mg/Kg, a 10kg child would need to drink 50 Litres of fluoridated water containing 1mg/L of fluoride, which is 5.5 times the lethal dose of water. So again - **it is impossible for a 10kg child to experience acute fluoride toxicity from just drinking-water optimally fluoridated at levels of 0.7 to 1 ppm.**

"Fluoride intake of 40-70 mg/day can cause heartburn and pains in the extremities". That is an easy one to answer – don't drink 40-70 litres in a day!

"Fluoride is more toxic than lead and just slightly less toxic than arsenic" is an emotive statement frequently quoted yet easily countered by adding two simple clarifications:

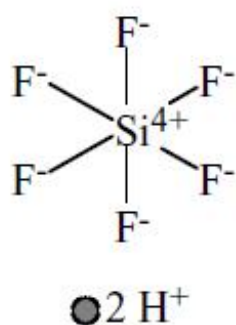
(1)....but not [toxic] at 1 ppm in fluoridated water and

(2)....by "protecting" the people of Patea and Waverley from unproven toxic effects of low levels of fluoride we will increase levels of dental caries (proven effect) which will lead to either poor health, if untreated (likely, given the cost), or (if treated), exposure to mercury (as most will not be able to afford ceramics). While mercury in amalgam is considered safe by dentists, mercury is still a proven and well recognised **neurotoxin**. It was during the 1800s that the phrase "mad as a hatter" was coined, owing to the effects of chronic mercury exposure in the hat-making industry of the time.

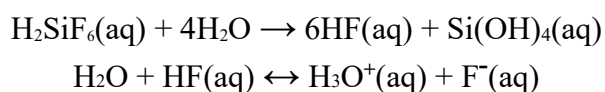
But what about the extra fluoride in our diet? [see **Appendix 2**]

"Hydrofluorosilicic Acid is a toxic waste product, unlike 'natural fluoride' such as calcium fluoride": The term "waste product" is clearly an emotive term as it is more accurate to call it a by-product of the fertilizer industry, just as molasses is a by-product of the sugar industry. Given New Zealand's need for fertilizer, it makes HFA not only cheap and readily available, but is recycling a product that otherwise would become a waste product needing to be safely disposed of. Many countries are unable to afford to fluoridate their water and pay a heavy price in poor dental health as a result.

Hydrofluorosilicic Acid (HFA)



In water, hydrofluorosilicic acid readily hydrolyzes to hydrofluoric acid and various forms of amorphous and hydrated silica. At the concentration [and] pH of drinking water, the degree of hydrolysis is essentially 100% ^{36 40 41 91}



The concern about an “acid” being put in the water is also groundless. HFA hydrolyzes to hydrofluoric acid (HF) which in turn releases fluoride and hydrogen ions at 1 part per million. In Hāwera, the pH is then adjusted up to about 8 (largely to reduce pipe corrosion) using soda ash, so there is no “acid” left in the water ⁴².

If anything, there should be far more concern about the water in Patea and Waverley being untreated (and un-chlorinated) and the fact that the **Boron** levels from the lower Patea aquifer are kept below the MAV for boron (1.4mg/L) only by dilution with water from the upper aquifer ⁴². Boron becomes increasingly toxic (to testes and fetuses) as the concentration rises ⁴³.

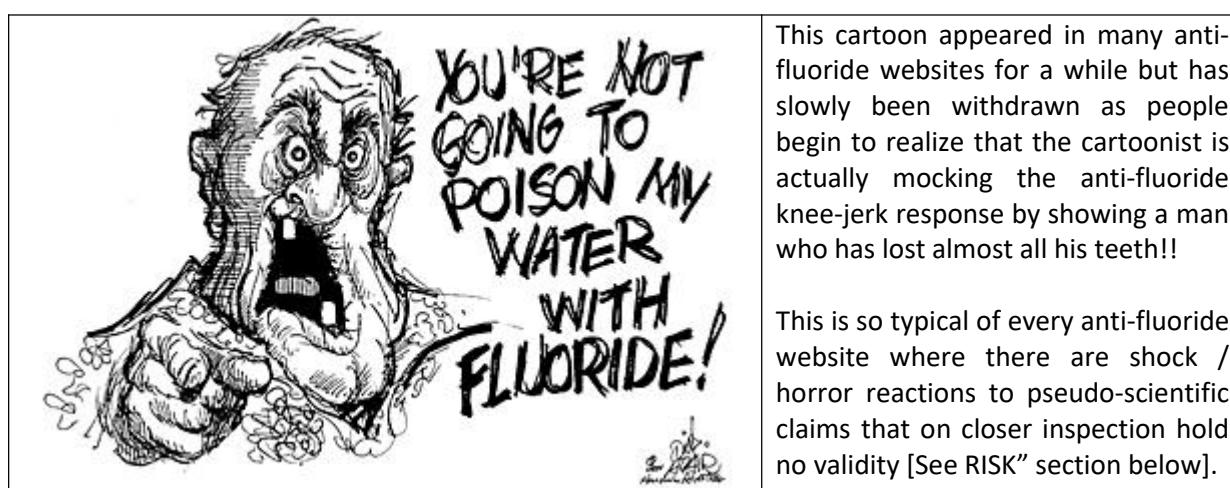
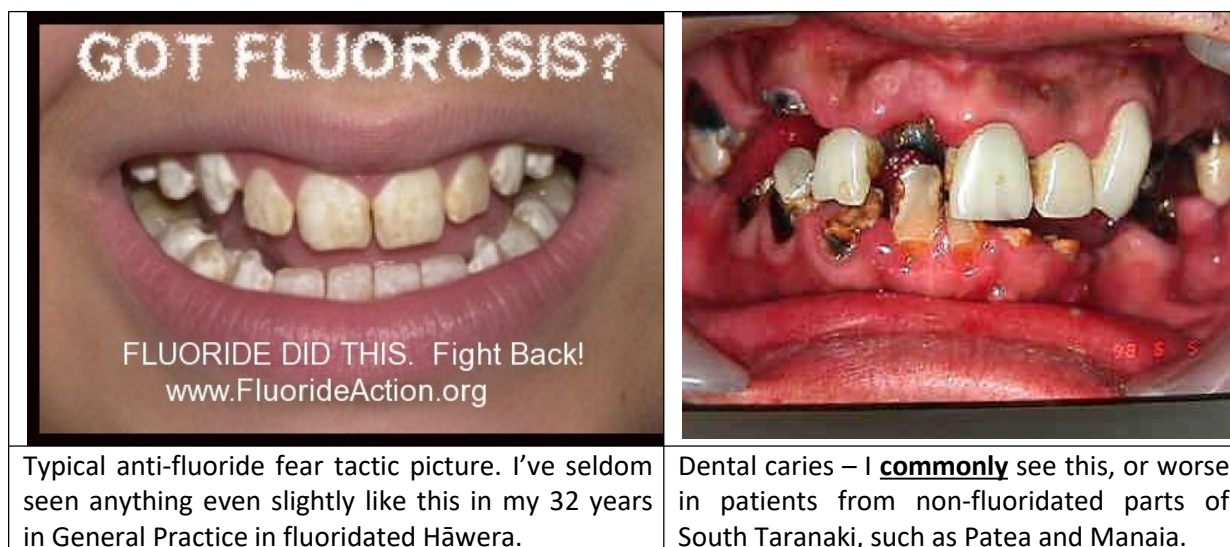
“**Natural Fluoride**” - the concept that Calcium Fluoride is a safe “natural” chemical is just not scientific. We hear that “**The lethal dose of Sodium Fluoride (an artificial fluoride) is 50 times smaller than that of CaF₂ (a naturally-occurring fluoride)**”. Calcium Fluoride is only “safe” because it is largely insoluble, but what little does dissolve produces fluoride ions exactly the same as fluoride from Sodium Fluoride or the dissociated fluoride from HFA, giving exactly the same potential risks and benefits. Contrary to claims from FANNZ, once HFA is added to water, fluorosilicic acid readily hydrolyzes to hydrofluoric acid and various forms of amorphous and hydrated silica. At the concentration and pH of drinking water, the degree of hydrolysis is essentially 100%” ^{36 40 41}.

The fact is that “natural fluoride” in ground water is also found as the dissociated ion, which will have come from any of a number of fluoride-containing minerals.

To suggest that the calcium ion of Calcium Fluoride (CaF₂) somehow “**buffers**” the effect of fluoride, “**safeguarding the human body**” ³ is also nonsense. At a concentration of 1 ppm fluoride, there would be approximately 1ppm calcium ion [MW of CaF₂ = 78.1, composed of 1 calcium (AW=40.1) atom and 2 fluorine (AW=19) atoms], which is 1% of the concentration of calcium in Extracellular Fluid, so it would be insignificant.

“**A seven ounce tube of toothpaste, theoretically at least, contains enough fluoride to kill a small child**” is a frequently used quote that originates from the extremely unscientific book *Fluoride the Aging Factor*. [see Appendix 2] A single 200g tube of 1,000ppm fluoride could kill a 4kg new born baby but they don’t tend to pick up tubes of toothpaste and eat them at that stage and in NZ adult sized toothpaste comes in approximately 100g tubes. A slightly older 5kg baby fed a whole Colgate Junior tube (which has lower fluoride concentrations) by say an older sibling would not even reach the 5mg/kg LD₅₀ figure proposed by Whitford ²⁸. **Maths and parenting aside, we are actually debating fluoride in water at 1 ppm, not toothpaste at 1,000 (or 400) times the strength.**

“**Dental fluorosis rates have reached unprecedented levels**” claims, along with photographs of a very rare form of fluorosis, are often shown, while the extremely common and very dangerous effect of dental caries on teeth is ignored. The NZ Dental Association states “When considering the slight white flecking that can occur from fluorosis, it is also necessary to consider the pain and poor appearance caused by dental decay. The effects of decay are much more significant.” ⁵¹ [See Appendix 5 and the discussion on fluorosis in the “Risks” section below]



“Fluoridation of water is against the wishes of the people” is a claim that should be of concern to any democratic body like the STDC. However, there is no evidence for this, in fact there is good evidence that most people either don't mind, don't care or actually believe the professional opinion that the benefits far outweigh any risks. A more accurate claim should be that fluoridation is **“Against the wishes of a vocal minority of flat earthers and Luddites”**.

Take the very popular Internet social networking service **Facebook** as an example. The **Fluoride Free Taranaki** Open Group has been up for 18 months and despite three public hearings (NP, Stratford and now ST) it has managed to attract only 125 members, 20% are openly from outside Taranaki and a good proportion openly hold “alternative” (non-scientific) beliefs about health. Nationally, the **Fluoride Free NZ** website can only muster 1,076 likes in 2½ years, compared this to the 55,213 hits and 811 “Likes” in only 19 days for the **South Taranaki Needs Hāwera Hospital** page last year or the 1,686 likes in ONE DAY for the **Normanby OverBridge – Replace It** page this year.

“Fluoridation of water is mass medication (or “enforced medication”)” is a claim that raises personal rights issues and valid concerns that health treatment should be individualized and require informed consent. This is an issue I hold dear, and along with many of my colleagues,

was unhappy with government “population based” health changes based on race and area code. In fact I remain the ONLY GP in Taranaki who was able to reject this and remain independent of the PHOs, disadvantaging both my patients and myself financially.

However, this argument is not valid for fluoridation. The Medicines Act & Human Rights Commission found that fluoridation is NOT a treatment, it is “topping up” something already naturally present in our water to the optimal level ⁵⁵. In New Zealand, fluorides are classed as a “related product” (not a medicine) if under 1,000ppm fluoride [Medsafe ⁵⁹]. The term **medicine** excludes dental substances for managing caries (Medicine Act 1981) ⁶³ and fluorides are not Pharmacy only Medicines if in a liquid “containing 15 milligrams or less per litre” (Medicines Regulations 1983) ⁶¹. Medsafe “does not identify fluorides used to adjust fluoride levels in community drinking waters as medicines” (ESR ⁶²).

So, at the 1ppm or lower concentration found in most fluoridated water, fluoride is not a medicine but an additive, like iodine to salt and the planned introduction in NZ of folate to bread. Most breakfast cereals, Marmite and other processed food have numerous additives which are far less beneficial to health than fluoride and have evidence for toxicity at quite low levels, but these are not being objected to.



For example, Marmite contains 36mg of elemental iron per 100gm. A 10kg child eating the smallest jar (125g) would exceed the UL of 40mg/day and would easily reach the lower level for iron toxicity of 10mg/kg.

Marmite also contains 3,400mg of sodium per 100g, so a child consuming the smallest jar of 125g would get 4,250mg, 4.25x the UL of 1,000mg/day! **A 12 month toddler obtains ALL his/her Adequate Intake (AI) of sodium of 170mg from just ONE serving (5g) of Marmite!!**

This is mass medication (both Iron and sodium are medicines) to a far more dangerous level to far more Kiwi kids who all eat far too much Marmite (particularly as they also eat Cheezels, chips and takeaways and other high salt foods).

“MASS MEDICATION” of Kiwi Kids providing toxic levels of salt and high levels of iron

When it comes to “choice” and “personal rights, it is often the job of local or central government to determine what is the greater good, and may well need to restrict the rights of a few to ensure the rights of many.

For example, we restrict the right to smoke when it affects the rights of others to fresh air. In the fluoride debate, those few objecting to having fluoride in the water seem motivated and able to afford “reverse osmosis filters” or set up rain water collection systems to avoid this perceived toxin and (unlike a majority of those who will be receiving protection of this extension of Fluoridation to Patea and Waverley) are generally able to afford adult dental care. Are these objectors, and any Councillors who agree with them, willing to pay the ongoing future increased dental costs for the economically challenged people of southern South Taranaki, including transport costs, given the severe shortage of dentists in South Taranaki and the cost of ceramic fillings, as those deeming fluoride too toxic for them shouldn’t expect them to then use mercury amalgams!

Finally in this section on **emotional tactics**, there is a very sinister aspect of FANNZ. It is worse than simple irony that on one hand they imply that the Nazis and Communists used fluoride to control populations (a good story not supported by the facts) while on the other they are promoting a fascist “Name and shame” campaign. If I may quote from their website: “**Tell us who promotes fluoridation in you (sic) area! FANNZ is compiling a list of people responsible for artificial water fluoridation for our record when private litigation is taken. Councillors, community board members, public health officials, and anyone else who continues to promote neurotoxins in our water. Please email information to info@fannz.org.nz**”

I tremble in my boots, particularly as they have lost all local legal cases, as one would expect given the lack of reliable evidence to support their claims. The current anti-fluoride intention to use Section 23 of the Health Act 1956 is based on the assumption that fluoride is “likely to” pose health risks and that the standard of “likely to” has been defined by the courts as “a real, not fanciful, possibility, but not requiring a greater than 50% probability”. However the “real” risks listed are non-existent according to every recent systematic review (and I have checked them all).

The more notable legally based decisions, starting with the Privy Council ruling in 1964, include:

- **Privy Council**
The case against Lower Hutt fluoridating the water went all the way to the Privy Council where Lord Upjohn’s judgment was: “the Lower Hutt City Corporation had statutory power to fluoridate the water supply...The Privy Council has stated plainly where the common good lies, and to whom it is entrusted” and “the addition of fluoride adds no impurity and the water remains not only water but pure water and becomes greatly improved...”⁵² **also....**
- **NZ Drinking Water Standards** (rev. 2008)⁶⁷ promote the adjustment of fluoride to 0.7 to 1.0 mg/ litre.
- **Human Rights Commission** (1980) “in all circumstances therefore, it is considered that the question of fluoridation of water supplies by public authorities does not constitute a denial of human rights”⁵⁵
- **Advertising Standards Complaints Board** Decision 9 August 2005 {Complaint 05/211 Complainant: C Banks against West Coast District Health Board.}
Ruling: Complaint Not Upheld.⁵⁶

- **Advertising Standards Complaints Board** Decision 13 Sept 2005 {Complaint 05/239
Complainant: E. Belcher against West Coast District Health Board, Community and Public Health.}
Ruling: Complaint Not Upheld. ⁵⁷
The advertisement, published in The Messenger on 22 June, said:

WATER FLUORIDATION

Coasters Against Fluoride suggest that
fluoride causes cancer.
The Medical Director of the Cancer
Society disagrees.

Who do you believe?

So Belcher should have complained to the Grammar Standards Complaints Board about using “who” as an object instead of “whom” and it would have been upheld!! DHB managers may have MBAs but they suck at basic English.

- **Advertising Standards Complaints Board** Decision 13 Sept 2005 {Complaint 05/240
Complainant: E. Belcher against West Coast District Health Board, Community and Public Health.}
Ruling: Complaint Not Upheld. ⁶⁰
The advertisement, published in WEST COAST MESSINGER and the GREYMOUTH EVENING STAR., said:

WATER FLUORIDATION

South Auckland children have less tooth
decay than West Coast children.
Auckland has fluoridated water
Why should our children miss out?

- **Advertising Standards Complaints Board** Decision 12 July 2005 Complainant: Canterbury District Health Board against Grey District Councillor Ian Cummings.
Ruling: Complaint Upheld. ⁵⁸

H. Benefit of Fluoridation:

There have been repeated claims by FANNZ and other anti-fluoridation lobbyists that fluoridation does not reduce dental decay (dental caries). This claim appears to be based on some isolated “studies” or just opinions but I will explore their validity anyway.

In 1945, New Zealand held “the world record for annual average per capita consumption of sugar - well over 100 lb...and the world’s worst teeth” ⁸⁰. Prior studies showing that dental caries rates were lower in children drinking water naturally higher in fluoride than for children in low fluoride areas motivated the introduction of water fluoridation, to adjust fluoride levels to recommended ideal levels, but unfortunately it appears we missed the opportunity to design and carry out high quality prospective studies. However, as time progressed, better studies have been made.

(a) South Taranaki Studies: There are at least three unpublished studies on the affect of Fluoridation in the South Taranaki district.

- (i) Terence P Lealand BDS, is a registered Dentist who came to work in Hāwera 54 years ago, before the introduction of the school Dental Nurse program. He performed an observational study prior to the introduction of fluoridation which revealed that on each 6 monthly “routine” visit by children an average of 5.65 fillings were needed per child. He repeated the exercise approximately six years after the introduction of Sodium Fluoride to the Hāwera water supply and found the average fillings per six month routine visit was approximately 1 per child. ⁴⁴

This was an “observational study over time with dramatic effect” {LOE=III} which demonstrates a correlation, suggestive, but not proof of cause and effect. However as there was no reported similar drop in average fillings in primary school children from non-fluoridated areas in the district (exposed to similar brands of toothpaste etc., and of varied decile ratings), it is reasonable to add this information to other evidence supporting the use of fluoridation.

- (ii) Sandie Pryor BDS is a registered Dentist who has worked for some time in both Hāwera and Patea . She has written (but not published) two papers on her research of dental caries in Patea and Hāwera. ^{65 67}

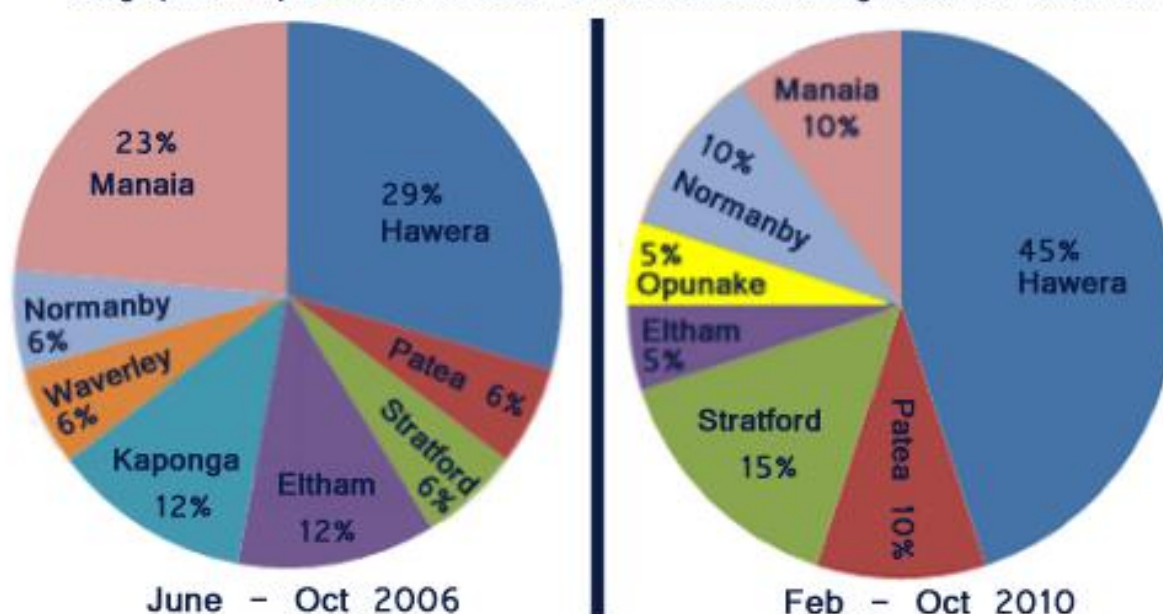
- a. The first study was a comparison of the DMFT (Decayed, Missing, Filled teeth) scores of 15 and 17 year old adolescents in non fluoridated Patea to those of fluoridated Hāwera over time. ⁶⁵ Hāwera, with a population of approx. 8,000 and a decile rating of 5 has been fluoridated for over 40 years. Patea, with a population of approx. 1,200 has a decile rating of 1 and is not fluoridated. The study was also over time to observe trends in dental decay in both communities from 2007 to 2010, unrelated to water fluoridation.

The 2007 study was a little small (26 from Patea and 260 from Hāwera) resulting in the average DMFT score difference for 15 year olds (5.1 for Patea and 3 for Hāwera) having low significance), but there was **a highly significant difference** ($p < 0.001$) for 17 year olds of 8.6 (Patea) and 3.9 (Hāwera). This **highly significant difference** was continued in the larger 2010 study (which had 40 from Patea and 305 from Hāwera). In 2010 the average DMFT scores for 15 year olds were 6.4 (Patea) and 2.7 (Hāwera), while for the 17 year olds the figures were 10.4 (Patea) and 3.6 (Hāwera).

While this appears to be an uncontrolled ecological comparison of children in a specific non-fluoridated area compared unfavourably to that of children in a specific fluoridated area with inherent issues over differences in diet, socio-economic status, exposure to discretionary fluorides, and oral health behaviours, it is in fact also an “**observational study over time with dramatic effect**” {LOE=III}. The reasonable conclusions that I can make are:

- i. Patea dental caries worsened in both 15 and 17 year old groups between 2007 to 2010 (mean DMFT up from 6.9 to 8.1)
 - ii. Hāwera dental caries improved somewhat in both 15 and 17 year old groups between 2007 to 2010 (mean DMFT down from 3.6 to 3.3)
 - iii. There is a highly statistically significant difference between dental caries between Patea (average DMFT over all ages and both periods of 7.6) and Hāwera (average DMFT over all ages and both periods of 3.4) [my calculations] which would be hard to attribute to anything other than the difference in community water fluoridation.
 - iv. The recommendation by the author that fluoridation of the Patea water supply would be significantly beneficial to the children of Patea is reasonable.
- b. The second study by Sandie Pryor followed the near three year cessation of fluoridation in Hāwera after the fluoridation plant broke down in 2006. Unaware that fluoridation had ceased, School Dental Therapists made observations about increasing decay rates in the youngest children. Her study recorded an increase in the percentage of three year old Hāwera children requiring General Anaesthetic (GA) for dental work, rising from 0% in 2006 to 11% in 2010. Also noted was an increase in the proportion of South Taranaki children needing GA who came from the Hāwera water supply area from 29% to 45% during the same time. She concluded that the lack of fluoride in the Hāwera water supply for nearly 3 years was associated with a significant and detrimental effect on the oral health of Hāwera children.⁶⁶

Geographical Representation of South Taranaki Children having dental work under GA

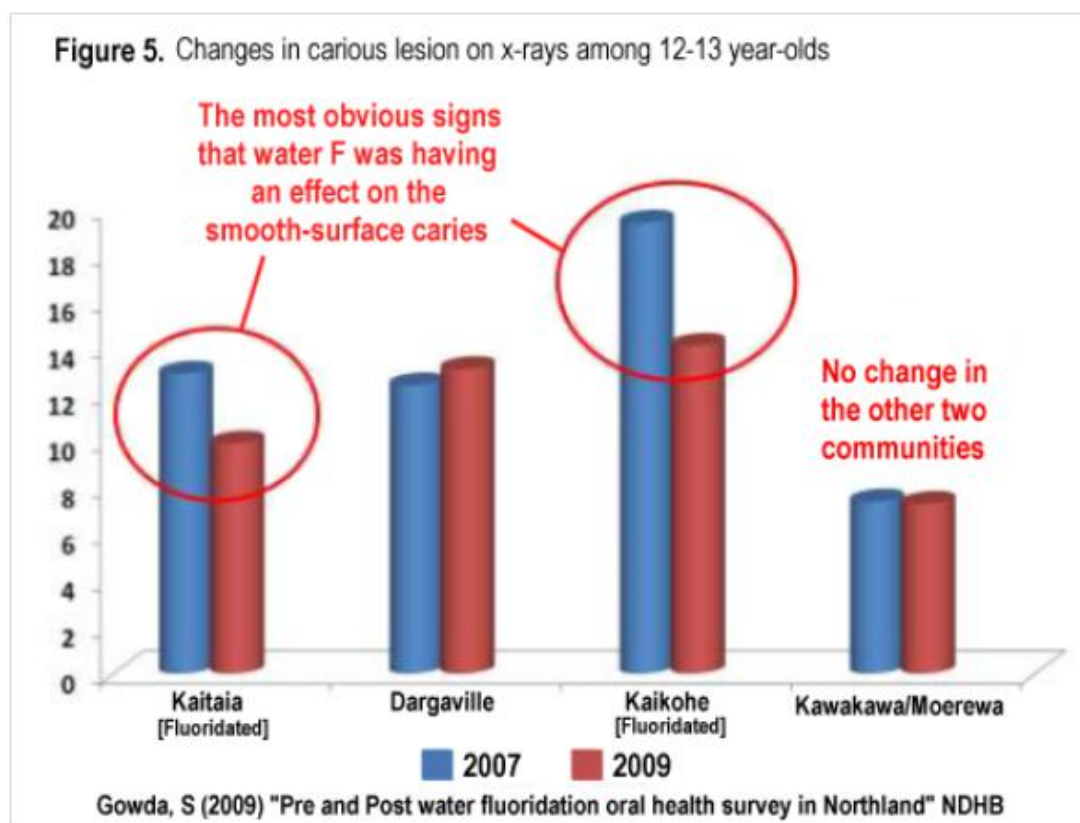


The conclusions that I can make are:

- i. Normanby is also part of the Hāwera water supply and the proportion needing a GA increased by the same proportion (by almost 2/3) as Hāwera. Combined Hāwera & Normanby figures are 35% in 2006 and 55% in 2010, providing even more significance.
- ii. {LOE=III-2}

(b) New Zealand Studies and reviews: There are a number of reviews since 2000.

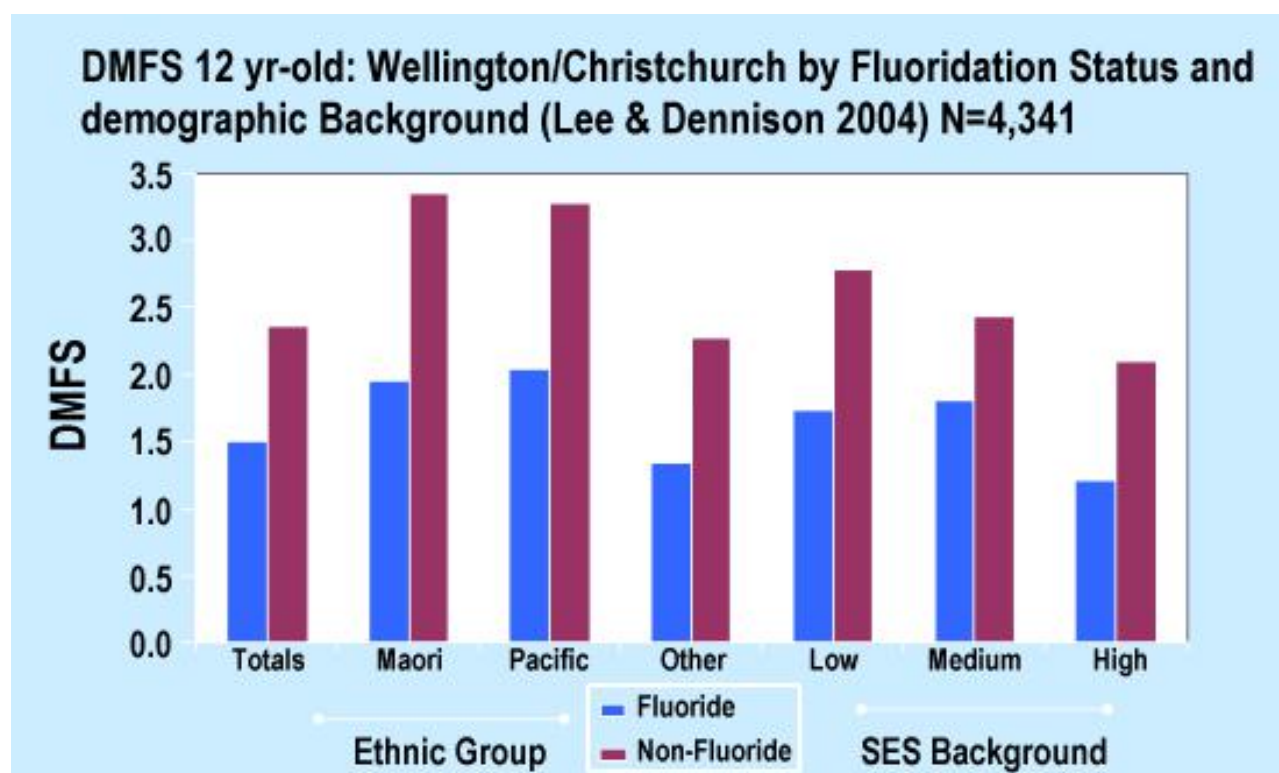
- **Pre- and Post-Water Fluoridation Oral Health Survey in Northland (2009)¹²**
 - The study concludes and reiterates that water fluoridation is effective in reducing smooth surface carious lesions, especially in a child population with very high rates of dental caries.
 - Water fluoridation benefits are usually seen after 5 years, but some beneficial effects observed in a high-risk population within two years.
 - This study shows that dental caries differs in different communities (so pure geographical studies are of low value) but then observing change after some communities are fluoridated not occurring in the non-fluoridated ones is very good evidence {LOE=II-2}

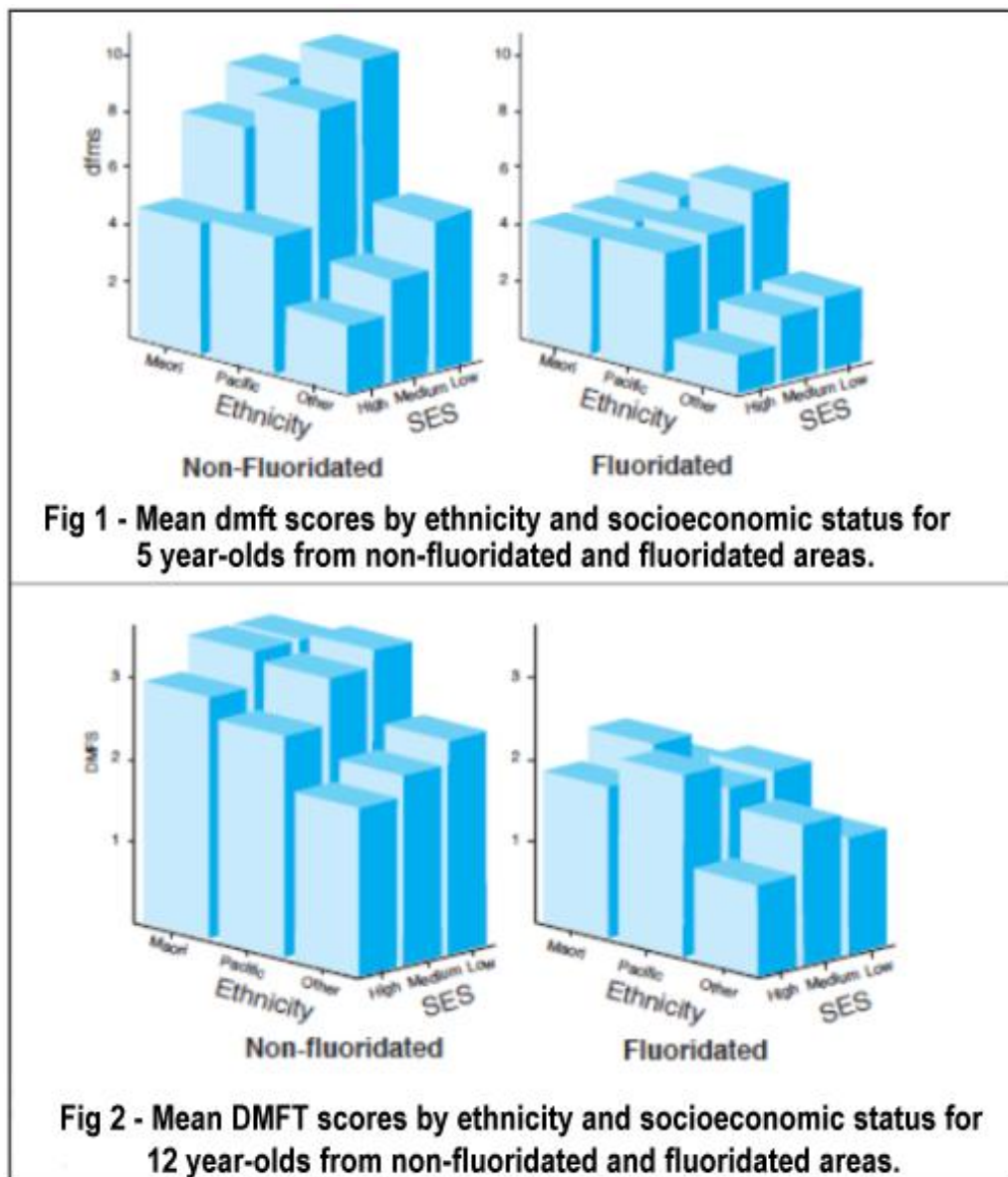


- **The Auckland Studies (2008, 2009)^{13 70}**
 - A strong protective dose-response relationship between caries experience and fluoridation status was seen, with children who lived continuously in

fluoridated areas being 0.42 times as likely to have dental caries as children who lived continuously in non-fluoridated areas ($P < 0.001$). 2009 ⁷⁰

- The prevalence of deciduous teeth dental caries was significantly lower in fluoridated areas (54.9 per 100) than in non-fluoridated areas (62.0 per 100), $P=0.05$. 2008 ¹³
- **The New Zealand Oral Health Survey 2005** ⁷²
 - Tooth decay is a real and widespread problem in New Zealand.
 - People living in fluoridated areas had, on average, significantly fewer teeth affected by decay than those in unfluoridated areas – across all age groups.
 - Children continuously exposed to fluoridated water during their life having half the dental caries experience of those who have not.
 - {LOE=II-2}
- **The Southland Study 2004** ¹⁴
 - A strong protective dose-response relationship between caries experience and fluoridation status was seen, with children who lived continuously in fluoridated areas being 0.42 times as likely to have dental caries as children who lived continuously in nonfluoridated areas ($P < 0.001$). {LOE=II-1}
- **The Canterbury and Wellington Study 2004** ⁷¹
 - A comparison of the oral health of children from Canterbury and Wellington (almost all of Wellington receives fluoridated water) showed that decay levels were 30 percent lower in the fluoridated areas.
 - The differences for Māori children were considerable – only 29 percent of Canterbury's Māori five-year-olds had no tooth decay, compared to 40 percent in Wellington.
 - Also see a more complex 3D graph on next page



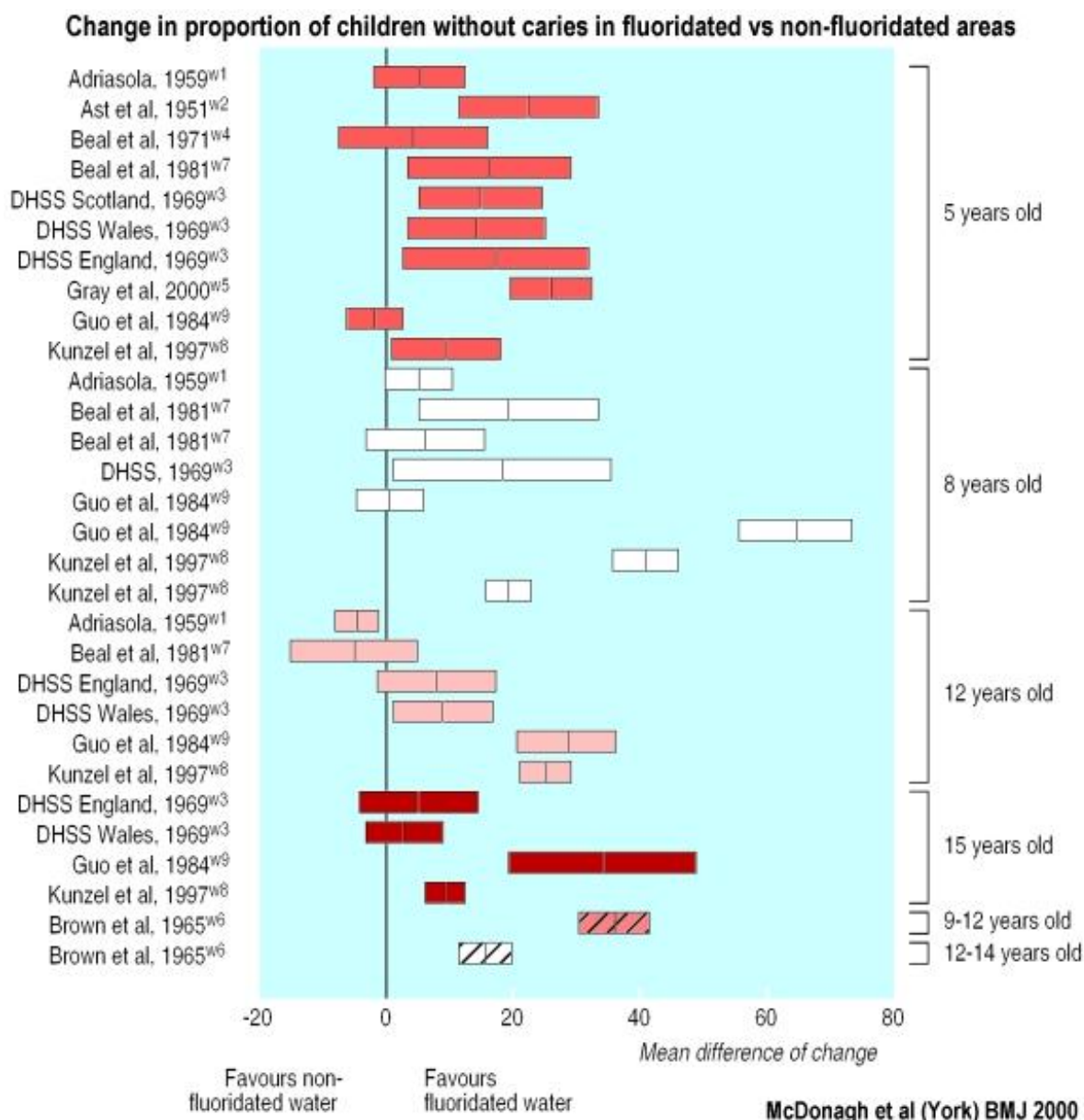


- **Public Health Association of New Zealand 2003** ⁷⁵
 - The lifetime benefit from drinking fluoridated water is estimated to be the prevention of 2.4 to 12.0 DMF teeth per person.
 - Fluoridation contributes to equity of health outcomes in lower socio-economic groups, Māori and children as they benefit more from dental caries prevention.
 - Surveys conducted from 1979 to 1989 in Australia, Britain, Canada, Ireland, New Zealand and the United States demonstrated a consistently and substantially lower decay prevalence in fluoridated communities.
 - The relative effectiveness of water fluoridation has decreased as the benefits of other forms of fluoride have spread to communities lacking optimal water fluoridation but there is still a significant benefit from water fluoridation.
 - Water fluoridation is effective throughout a person's life.

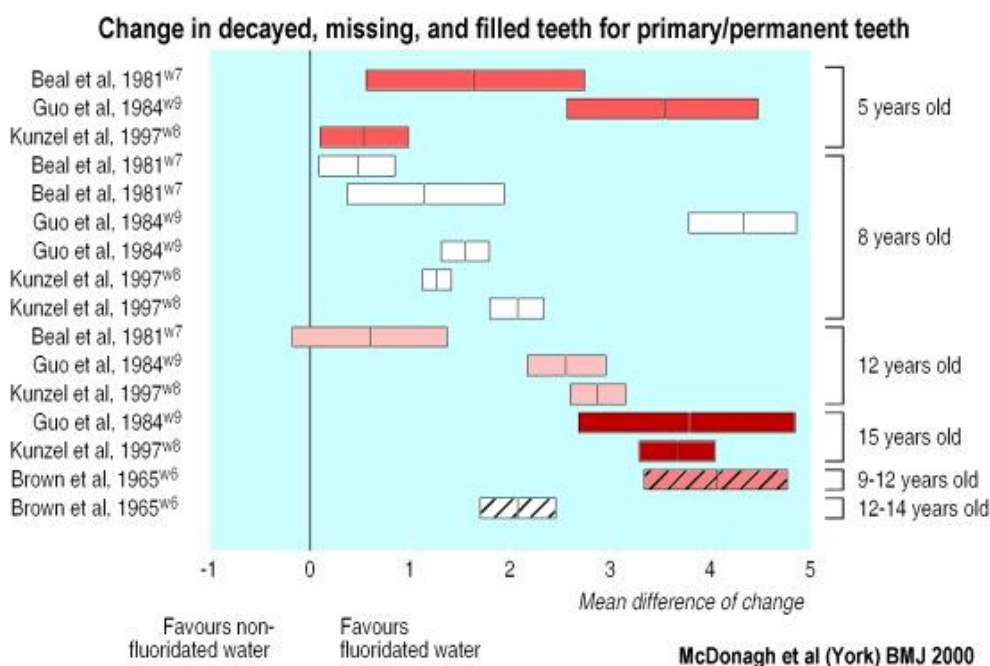
- At a population level, it is estimated that water fluoridation prevents between 58,000 and 267,000 decayed, missing or filled teeth in New Zealand per year saving \$14.3 million.
- Studies reveal fewer root caries among older people in fluoridated areas
- **Earlier Reviews include –**
 - Public Health Commission 1994** “*Water Fluoridation in New Zealand*” report ⁵⁵
 - Only two of 15 studies on water fluoridation in NZ published since 1980 failed to report significant benefits (from fluoridation)
 - Most studies were however, uncontrolled ecological comparisons and can create poor evidence used by both “sides” of the fluoride debate, so are best left out of the discussion.

(c) International reviews: There have been numerous reviews, so I will mention only some more recent and high quality systematic reviews for brevity.

- **Australia:** National Health and Medical Research Council (Australian Government) (2007) Systematic Review of the Efficacy and Safety of Fluoridation ²⁵
 - The existing body of evidence strongly suggests that water fluoridation is beneficial at reducing dental caries.
 - There is Level 1 evidence that topical fluoride agents reduce caries in children.
 - There is poor evidence for the use of fluoridated milk or salt.
- **Australia:** Australian Institute of Health and Welfare, University of Adelaide 1996 ⁷⁶
 - Community water fluoridation continues to be the most effective and socially equitable measure for caries prevention among all ages by achieving community-wide exposure to the caries preventive effects of fluoride.
- **Ireland:** Report on the Forum on Fluoridation 2002 ⁶⁹
 - Water fluoridation has been very effective in improving the oral health of the Irish population, especially of children, but also of adults and the elderly.
- **Ireland:** Systematic reviews of the effectiveness and safety of water fluoridation (Parnell et al 2009) ⁸⁴
 - The results of the three reviews showed that water fluoridation is effective at reducing caries in children and adults.
 - Water fluoridation, where technically feasible and culturally acceptable, remains a relevant and valid choice as a population measure for the prevention of dental caries.
- **UK: York (BMJ) 2000.** Review the safety and efficacy of fluoridation of drinking water ¹⁹
 - 214 studies were included. The quality of studies was low to moderate (earliest was 1951)
 - Reductions in the incidence of caries were found, but they were smaller than previously reported (possibly because of the greater use of fluoride toothpaste in non-fluoridated areas).



- Their graph (above) of studies showing “Change in proportion (%) of children without caries in fluoridated compared with non-fluoridated areas (mean difference and 95% confidence intervals shown)” reveals 19 of 30 trials had the 95% confidence levels showing significant increases in “no caries”, all but 3 trials showed increases and only one showed a decrease of significance.
- Their graph of “Change in decayed, missing, and filled teeth (mean difference and 95% confidence interval)” is shown on the next page, where only 1 of 16 studies not shown to be statistically better in the fluoridated areas.



- **UK: Medical Research Council** ¹¹⁵. Seven previous cross-sectional studies conducted in the UK between 1980 and 1990, have shown reductions in dental caries due to fluoride of the same order of magnitude as those reported in the (above) York 2000 Review.
- **USA: Centers for Disease Control and Prevention. 2001 Report** ¹²²
 - Widespread use of fluoride has been a major factor in the decline in the prevalence and severity of dental caries (i.e., tooth decay) in the United States and other economically developed countries.
 - When used appropriately, fluoride is both safe and effective in preventing and controlling dental caries.
 - Water fluoridation should be continued in communities currently fluoridating and extended to those without fluoridation. {LOE=II-1}
 - Also 1999 Achievements in Public Health Report - Fluoridation is one of the Ten Great Public Health Achievements of the 20th century which are thought to have added 25 years (of the 30 year increase) to the life expectancy in the USA ³¹
- **WHO 1994. The World Health Organisation Report** ⁸³
 - Fluoridation is safe and effective in preventing tooth decay.
- **WHO 2006. "Fluoride in Drinking-water" report** ⁷⁹
 - Concentrations in drinking-water of about 1 mg/L are associated with a lower incidence of dental caries, particularly in children.

(d) Anti-fluoridation Claims: There are repeated claims that community water fluoridation doesn't reduce dental caries. I have looked at all of these and they are few in number, generally old poorly designed studies from the 1970s-80s with major design and/or methodological deficiencies, all being ecological comparisons providing a poor level of evidence due to their inability to take into account other variations such as population change and socioeconomic differences. They lack the far higher strength of evidence of

numerous more recent (after 2000), better designed studies which consistently show significant benefit.

Of concern is the claim that “**There has been a convergence of caries prevalence in fluoridated and non-fluoridated areas since the 1970s implying lack of effectiveness of fluoridation**”^{77 78}

- These observations in the 1980s and 90s are not proof fluoridation doesn't reduce dental caries, but the other factors such as fluoridated toothpaste, better dental hygiene and better diet is also helping. Colquhoun's 1985 study has been classed as “low quality” **{C Grade Rec}** (MRC)¹¹⁵ and is not replicated in the recent New Zealand studies (see above) which continue to show that fluoridation is associated with much sharper declines of caries than seen in non-fluoridated populations.
- The convergence has also been attributed by the CDC as a “diffusion” or “halo” effect⁸⁵ as beverages and food processed in fluoridated areas but consumed in nonfluoridated areas, as well as the greater use of fluoridated toothpaste in non-fluoridated areas.
- In NZ there is no convergence between 2005-2009 according to the NZ School Dental Service figures for “% caries free” or DMFT scores between fluoridated and non-fluoridated children [SDS Data].
- This non-convergence could be partly due to NZ regulations requiring the use of distilled water in producing many commercial food and beverage products.

I. Claimed Risks of Fluoridation

Large human populations in the United States, United Kingdom, Ireland, Canada, Australia and New Zealand have now been using community water fluoridation for well over 50 years and so far there is **no persuasive evidence linking optimal fluoridation with any serious adverse health effects**. With hundreds of millions of people now having fluoridated water, this absence of documented serious adverse health effects is particularly reassuring on the safety of fluoridation.

The practice of adding fluoride to drinking water to improve dental health has been endorsed by numerous national and international health institutions, including the World Health Organization, the American Dental Association⁷⁵ (at highest risk of being sued), US EPA⁸², US CDC^{122 137}, Australian NHMRC, our Ministry of Health^{73 74}, NZMA, NZDA, NZ Public Health Association, NZ Dieticians Association and the NZ Cancer Society.

Despite the extensive claims of water fluoridation opponents, the only substantiated link between exposure to fluoridated water at 1ppm (=1mg/L) and **any adverse health consequence** is for mild dental fluorosis.^{19 62 70 82 84 93}

The issues most commonly raised by the anti-fluoride lobby are : Dental fluorosis, Bone fractures, Cancer (particularly Osteosarcomas), IQ and brain function (neurotoxicity), Heart Disease, Thyroid effects, Reproductive and birth defects, Arthritis, Renal (kidney) effects, Immunological effects and Pineal Gland involvement. I will discuss each of these, some more extensively than others, given their seriousness or comicality.

I [a] Dental Fluorosis

There is consistent Level III/IV {LOE=III/IV} evidence from existing systematic reviews that water fluoridation results in the development of dental fluorosis (mottled teeth), particularly if the drinking water fluoride concentration is over 2 ppm. However, the majority of dental fluorosis is mild and is not considered to be of 'aesthetic concern'.^{25 82 93}

The Southland study 2005 reported more frequent "diffuse opacities" among children who had lived all their lives in a fluoridated area but it had not increased. They also had half the dental caries!¹⁴ The Auckland studies (2008, 2009) also reported "diffuse opacities" in 29% of children in fluoridated areas vs 15% in non fluoridated areas, but again, this had not changed over 25 years.^{13 70}

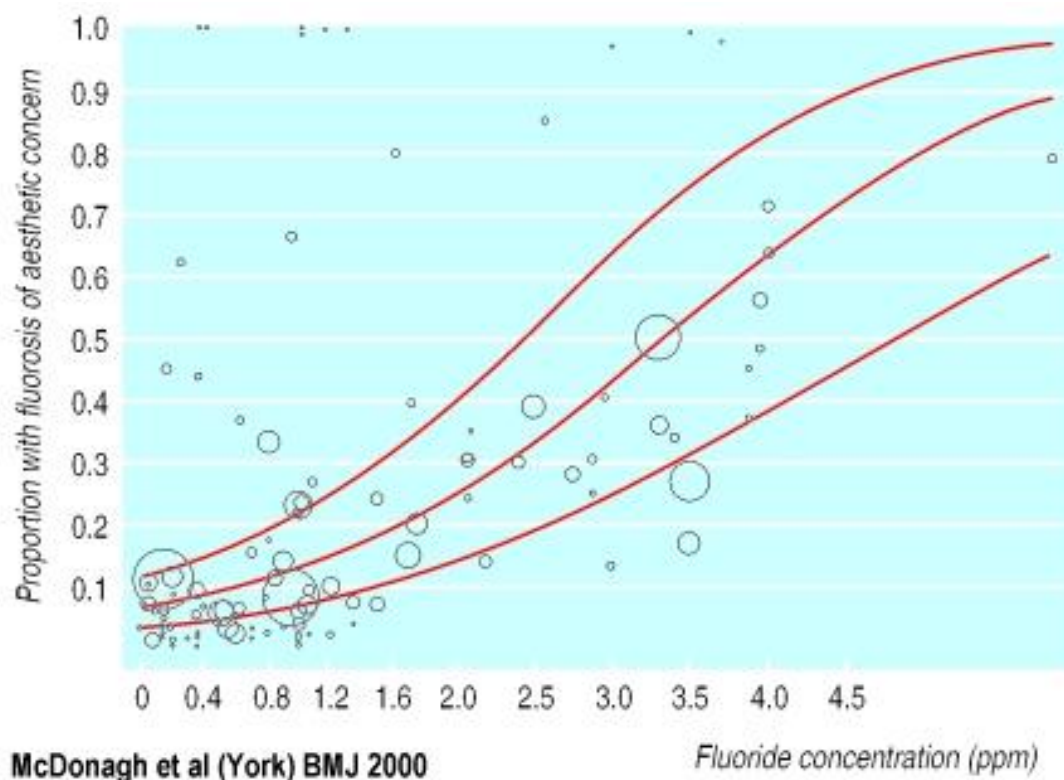
Diffuse Opacities

This raises concerns about dental fluorosis and what the term "diffuse opacities" means. It is considered by many to indicate only mild enamel fluorosis of little aesthetic importance, although assessment of the severity by current methods is difficult^{15 16}. Interestingly, a large national survey (1992) in Ireland revealed "The prevalence of enamel fluorosis/defects was found to be similar in children living in fluoridated and non-fluoridated areas in Ireland but the prevalence of diffuse opacities (DDE) was higher in the fluoridated areas¹⁷. This finding has repeated around the world as in the 2011 Swiss study⁶⁸ comparing two cantons using the Thylstrup-Fejerskov (TF) index, only one being fluoridated yet finding the exact same incidence (31.9%) of incidence of "fluoride-associated enamel opacities". FOP was the same (31.9%) in each canton. "Non-FOP" were in fact more in the fluoridated canton (30.8% vs 28.8%) and "hypoplasia of the incisors" was the same in both (12.6% vs 12.5%). Furthermore they noted "They [the opacities] did not represent an aesthetic problem and certainly not a public health concern". My conclusions on these findings are that "diffuse opacities" as seen in NZ studies cannot be interpreted to mean we are seeing worrying or even "moderate" enamel fluorosis (which is rare in Australia, New Zealand and the US) but would be a reasonable justification to recommend fluoride levels are kept at the lower end of the 0.7-1mg/L recommendation.

Fluorosis of aesthetic concern

The York review gives us a graph showing the "Proportion of population with fluorosis of aesthetic concern by water fluoride concentration". This is reproduced on the next page. Each circle represents a study area in which the proportion of people with fluorosis is estimated -the larger the circle, the higher the precision of the estimate.¹⁹

While there is a wide scatter, including significant studies of 10% fluorosis rates with fluoride concentration below the 0.2ppm already found in Patea and Waverley water, the proportion with fluorosis of aesthetic concern does seem to rise over concentrations of 1ppm (1mg/L).



Moderate to severe fluorosis

Moderate fluorosis which causes staining but not pitting of teeth, increases to about 15% if fluoride levels reach at 2 mg/L and more severe fluorosis is seen above 4mg/L.⁸²

Severe fluorosis is VERY Rare and virtually never reported outside areas with very high water fluoride concentrations (aka “endemic fluorosis areas”)

It is claimed that “Fluorine intake of 20-40 mg/day can inhibit the important enzyme phosphatase. Phosphatase is needed for calcium utilization/metabolism in tissues including the bones and teeth. You can increase your risk of mottling (permanently discolored teeth during tooth development), brittle tooth enamel and bones as well as brain damage.” That is if one drank 20-40 litres of fluoridated water!!!

I (b) Skeletal Fluorosis and Fractures

Endemic Skeletal Fluorosis

This is a condition associated with high fluoride ingestion and it has not been reported in the EU (SCHER 2010)⁹² [despite fluoridation in significant sections of United Kingdom and Ireland fluoridating at around 1ppm]. The UK MRC states the risk for skeletal fluorosis is $\geq 8\text{mg/L}$ ¹¹⁵.

Bone Fractures

There is evidence that at high doses fluoride can weaken bone and increase the risk of fractures, but not in the concentration in fluoridated water of 1 or less part per million. Studies showing increased risk with lifetime exposure over 4mg/L exist (National Research Council 2006)⁸² but are not relevant as all the reviews for up to 1.5mg/L show no increased risk or even protection to bones eg:

- There is “No clear association of hip fracture with water fluoridation. The evidence on other fractures is similar.” (York Review 2000) ¹⁹
- “Lifetime exposure to fluoride in drinking water at 4mg/l is likely to increase fracture rates compared with exposure at 1mg/L.” (National Research Council 2006) ⁸²
- “Water fluoridation at levels aimed at preventing caries has little effect on fracture risk – protective or deleterious.” ²⁵
- There is a clear excessive risk of adverse skeletal effects for a total intake of 14mg/day and suggestive evidence of an increased risk of effects on the skeleton at total fluoride intakes above about 6mg/day. ⁹⁴

We read claims that “An increase in hip fracture rate is seen in patients treated with high dose fluoride (40-60 mg daily), in combination with calcium and vitamin D.” To get this amount of fluoride from fluoridated tap water, one would need to drink 40-60 litres in a day!

Also “The first study reporting an association between fluoridated water and hip fractures in the elderly was published. It was a large-scale one. Computerization has made possible the accumulation of vast data banks of information on various diseases. Hip fracture rates have increased dramatically, independently of the increasing age of populations. Seven other studies have now reported this association between low water fluoride levels and hip fractures”

- The study in question⁸⁸ actually only noted a weak ecologic association between hip fracture discharge rates in the United States and fluoride content in water supplies. It made no attempt to control for known factors such as urban vs rural reporting, physical activity, sun light exposure, body mass index, race, and as pointed out by many in the US, cows milk consumption! The “Computerization” claim is irrelevant as it applies just as much to most of the studies showing no relationship as well.
- The other studies referred to also show variability in hip fracture incidence by geographic region, with the highest rates found in Scandinavia, followed by the United States, Western Europe. Interestingly, Scandinavian countries are largely unfluoridated!
- Epidemiologic studies from Finland and the United States demonstrated lower rates of hip fractures associated with higher water fluoride levels ⁸⁹. Cooper et al 1991 ⁸⁹ could show no significant association between hip fracture discharge rate and total fluoride concentration in water supplies.
- A New Zealand study also revealed that a “substantial regional variation exists in the incidence of hip fractures among older people ... age-standardised rates being consistently highest in the West Coast (790 per 100,000 for women and 360 per 100,000 in men) and lowest in Northland (540 per 100,000 in women and 185 per 100,000 in men).” ⁹⁰ As both of these regions were unfluoridated at the time, no conclusion is possible.]
- No association between hip fractures and water fluoride levels in studies from Canada ⁹⁵, Finland ⁹⁶ or Australia ²⁵.
- China: Li et al (2001)²⁹ reporting on the effect of long-term exposure to various concentrations of fluoride in drinking water published some interesting data, best seen in graph form, where there is a clear “U-shaped” curve showing a protective effect on bones around the 1ppm concentration and higher fracture rates at both higher and lower levels. This is “just” significant (p<0.05) for the 1ppm group but it is

reassuring.

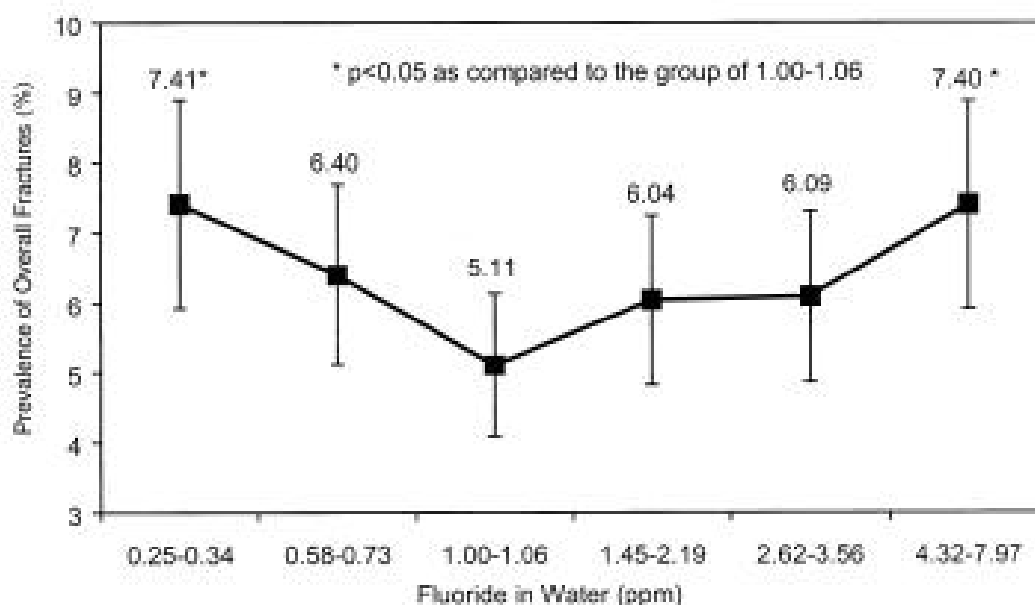


FIG. 2. Prevalence of overall fractures and fluoride concentration in drinking water in six Chinese populations since the age of 20 years.

I(c) Cancer

Systematic Reviews after 2000 from Australia (NHMRC)²⁵, UK (NHS)¹⁹, Ireland ^{70 84}, EU ⁹², USA ⁸², and New Zealand ^{62 76} have consistently found no clear association between water fluoridation and incidence or mortality of cancers.

The American Cancer Society reported in 2010 that “More than 50 population-based studies looking at the potential link between water fluoride levels and cancer have been reported in the medical literature. Most of these have not found a strong link to cancer”.¹⁰⁵

In the United Kingdom, the National Health Service (NHS) Centre for Reviews and Dissemination, University of York, published a systematic review of water fluoridation in the year 2000 “Overall, no clear association between water fluoridation and incidence or mortality of bone cancers, thyroid cancer, or all cancers was found.”¹⁹

Australia: The existing systematic review by McDonagh et al (2000a) concluded that there is no clear association between water fluoridation and overall cancer incidence or mortality (for ‘all cause’ cancer, and specifically for bone cancer and osteosarcoma).¹⁹

WHO (2006): “in spite of the large number of studies conducted in a number of countries, there is no consistent evidence to demonstrate any association between the consumption of controlled fluoridated drinking-water and either morbidity or mortality from cancer.”⁸⁰

In 1997 the EPA stated “...the weight of evidence from more than 50 epidemiological studies does not support the hypothesis of an association between fluoride exposure [in drinking water] and increased cancer risk in humans.”⁸²

Osteosarcoma

As fluoride is absorbed preferentially into calcified tissues like bone, it is not surprising to see attention being paid to whether there is any increase in primary bone cancers being masked by the fact there has been no evidence of association of non-bone cancers with fluoridation.

Until recently, all well designed studies and systematic reviews failed to show any “clear association” between water fluoridation and osteosarcoma,¹⁹ which is a rare cancer.

In 2006 a matched case-control study {LOE=II-3} showed an association in young males (Bassin⁹⁷ aka “the Harvard Study”). This “exploratory analysis” was of 103 cases under the age of 20, a sub-set of patients from a larger case-control study initiated by the Harvard School of Dental Medicine which has since shown no association⁹⁸. The Bassin trial methodology has been criticized and the results have not been able to be replicated, including prospective studies and no animal studies support the link⁹². A subsequent study involving “Orthopedists” from nine U.S. hospitals identified a cohort of 137 osteosarcoma cases and a cohort of 51 tumor controls between 1993 and 2000. They found “There was no significant difference in bone fluoride levels between cases and controls.” Kim et al 2011⁹⁸

In 2011 a large retrospective (1994-2006) ecological study by Comber et al (2) compared the incidence of osteosarcoma in Northern Ireland (no CWF) to the Republic of Ireland where 70% of water is fluoridated and found no statistically difference in osteosarcoma for any age or gender. While this study has limitations as an uncontrolled ecological study {LOE=III-2}, it is large and does not support any link between osteosarcoma and community water fluoridation¹⁰⁶.

At present, the cautious approach is to state “Assessing fluoride as a risk factor for osteosarcoma is complicated by the rarity of the disease and that population is all generally exposed to some level of fluoride.”⁸². SCHER (2010) have stated that “fluoride cannot be classified as to its carcinogenicity. The US Centers for Disease Control and Prevention (CDC) has issued a statement on water fluoridation and osteosarcoma in response to the [Bassin] study, noting that “at this time, the weight of the scientific evidence, as assessed by independent committees of experts, comprehensive systematic reviews, and review of the findings of individual studies does not support an association between water fluoridated at levels optimal for oral health and the risk for cancer, including osteosarcoma.”

I frequently find claims that “**The recent Taylor Study, University of Austin showed that fluoride concentration of 1PPM (parts per million) increases tumor growth rate by 25%**” I’m glad you brought that up....I found that this quote is taken from an 8-page *Lifesavers Guide to Fluoridation*, produced by Yiamouyiannis¹⁰², which contains 250 references from a variety of journals, court cases, books, newsletters, symposia and newspapers, as well as several personal communications. Subsequent review of his citations have demonstrated many of them to be false or incorrectly interpreted. John Yiamouyiannis, Ph.D. (1943–2000) liked to call himself “the world's leading authority on the biological effects of fluoride.” His rejection of science based medicine led directly to his untimely death in 2000, from cancer.

The study referred to causing this unbelievable cancer acceleration, when found, was an old (1965, so hardly “recent”), poorly controlled vivisection study where mice mammary adeno-carcinoma was exposed to fluoride (of no set dose) before or after implantation into the mice and the size of the cancer measured after a variable number of days (8-10). Similar experiments were done on eggs.¹⁰⁸

The authors, Alfred and Neil Taylor found that giving mice 1 to 5 mg of sodium fluoride per litre of distilled water orally produced an apparent increase in tumour size of 21%. (a little less than the exaggerated 25%). The growth was less if the fluoride was injected. Similar responses were seen in other experiments with sodium Bromide and Iodide.

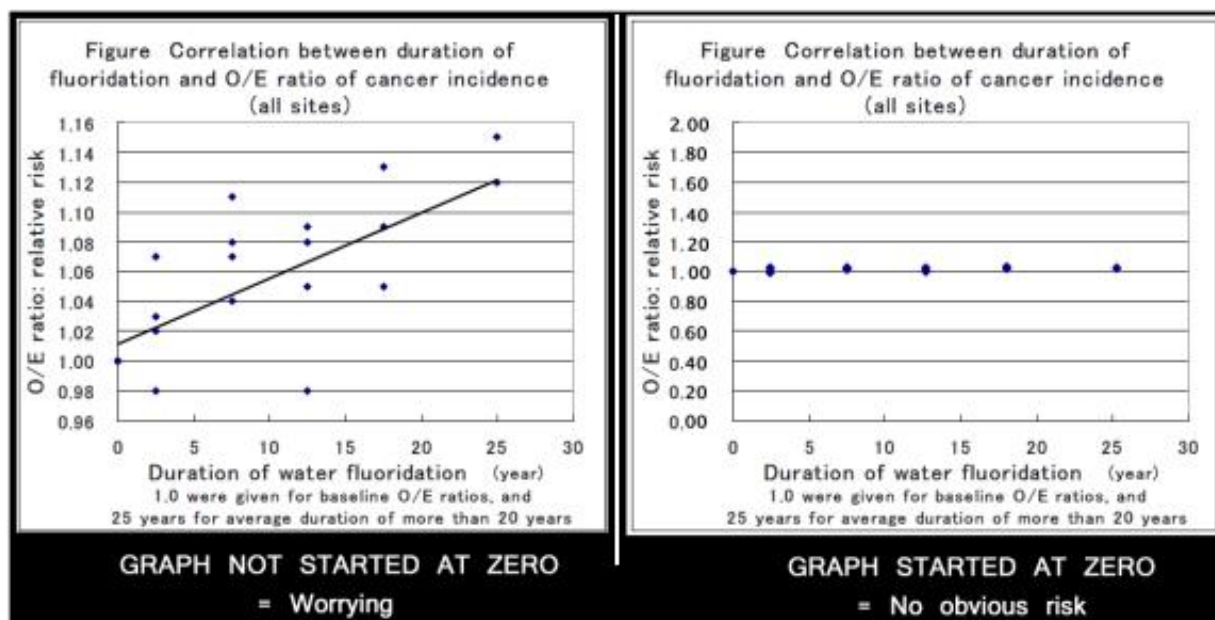
This study is highly suspect on a number of levels:

- Two scientists of the National Cancer Institute after reviewing Alfred Taylor's work stated: "Dr. Howard Andervont and I (Dr. H. T. Dean) have carefully evaluated the data with respect to the alleged relation of fluoride water to an accelerated rate in the development of mammary tumors and are of the opinion that the evidence adduced does not warrant any modification in the policy of recommending fluoridation of public water supplies for the partial control of dental caries." ¹¹¹
- The results were not accepted by subsequent expert reviews (IARC, 1982; Knox, 1985)¹¹⁵.
- If the Taylor studies showed "similar responses" for Sodium Bromide and Iodide, why has there been no observed cancer progression of cancer in people using iodised salt? In New Zealand salt iodisation level is in the range of 25-65 mg of iodine per kg of salt. At the average 4,000mg/day salt consumption, an adult would get 100-260 mg iodide/day compared to the 1.9 mg/day fluoride ingested in fluoridated areas.
- One mouse study with very poor control standards performed almost 50 years ago using higher concentrations of fluoride than recommended in drinking water and producing results never seen before or since (either in laboratory animals or in humans) on an artificially created tumour (which may well have unusual responses) is hardly the basis for restricting human access to appropriate, proven safe and effective fluoridated water.
- I was also amazed to discover that the principal author Alfred Taylor 1896-1973 was also known for his Theosophical writing ¹⁰⁹. Theosophical teaching is strongly against vivisection, is pro-moral vegetarianism and anti-fluoridation [see I (k) on the Pineal] and in his paper on "Theosophical Study and Research" (1960) ¹¹⁰ Taylor writes about "The harmony of life" and compassion for animals. He also authored three major Theosophical books [Understanding through the Ancient Wisdom and Modern Science, Theosophical Publishing (Wheaton, IL), 1959.; The Secret Doctrine: Commentaries and Analogies, Krotana School of Theosophy, Series I, 1970, Series II, 1971 and "A Human Heritage: The Wisdom in Science and Experience" , Theosophical Publishing, 1975]. All this seems incompatible with the experiment as described but does raise questions of observer bias.

One of the quotes from John Yiamouyiannis was **"Studies show cancers increase by 5% when fluoride is added to the community drinking water. We can expect in the area of 10,000 fluoridation-linked cancer deaths yearly; in other words, over 500,000 people, alive today, can expect to die of a fluoridation-linked cancer unless something is done to stop fluoridation in the U.S."** (testimony delivered to Congressional Committee, 1977) ¹⁰⁷ His estimate of fluoride poisoning deaths was up to 30,000 - 50,000 in his book *Fluoride: The Aging Factor*. These figures were also used by a **Dr. Dean Burk**, former Chief Chemist of the National Cancer Institute and Laetrile supporter and are a classic example of bamboozling by pseudo-science. 35 years later we have yet to see this tide of fluoride related cancer deaths.

Claims of **"increasing Observed to expected cancer ratios"** rising have been graphically displayed but these make the classic error of not starting the graph at zero, as seen on the graph on the next page. I took the same figures and plotted them on a graph beginning at zero

and suddenly the worrying trend can be seen for what it is, an almost flat line. This graph doesn't inform the observer if the fluoride exposure over the 25 years was at 1ppm or higher (2-4ppm were not uncommon in some areas of the US) nor the numbers involved, and confidence intervals to see if this was a real trend or easily explained by chance.



Conclusion: Optimal fluoridation of drinking water does not pose a detectable cancer risk to humans as evidenced by extensive human epidemiological data available to date, including the most recent studies.

I (d) IQ and Brain Function / Neurotoxicity

There is good evidence to link long term exposure to very high fluoride concentrations with effects on intelligence of children (as demonstrated by reduced IQ), as there is with any number of ingested substances shown to be safe at lower levels, but there is no evidence to show these effects occur at the concentrations recommended for community water in New Zealand. All the studies quoted "proving" a link between lowered IQ and fluoride in water come from areas (mostly China) where there are very high "natural" levels of fluoride (and I suspect some "unnatural" or polluted water sources) of over 2.5 mg/L, and in many cases over 4 mg/L. Most are not of sufficient quality to be published in reputable peer reviewed journals but the consistency of the results appears significant enough to warrant additional research on the effects of fluoride on intelligence.⁸²

Various Systematic Reviews conclude:

- There is insufficient evidence to permit confident conclusions (York 2000).¹⁹
- The additional studies do not suggest an increased risk of other adverse events with the level of fluoridation used in Australia [c. 1 ppm] (NHMRC 2007)²⁵
- That there is not enough evidence to conclude that fluoride in drinking water may impair IQ. (SCHER 2010)⁹²
- At lower fluoride concentrations (eg 0.91 ppm), which are more comparable to the levels in fluoridated water in the UK, a reduction in children's IQ was not observed (Lu et al., 2000¹⁰³; Zhao et al., 1996)¹¹⁶; MRC (UK)¹¹⁵

However, anti-fluoride lobbyists blatantly criticise Territorial authorities for putting a human “**neurotoxin**” in the water and cite studies on humans to support their claim, such as:

1. We read “**The intelligence was measured of 907 children aged 8-13 years living in areas which differed in the amount of fluoride present in the environment. The Intelligence Quotient (IQ) of children living in areas with a medium or severe prevalence of fluorosis was lower than that of children living in areas with only slight fluorosis or no fluorosis. The development of intelligence appeared to be adversely affected by fluoride in the areas with a medium or severe prevalence of fluorosis. A high fluoride intake was associated with a lower intelligence.**” ⁹⁹

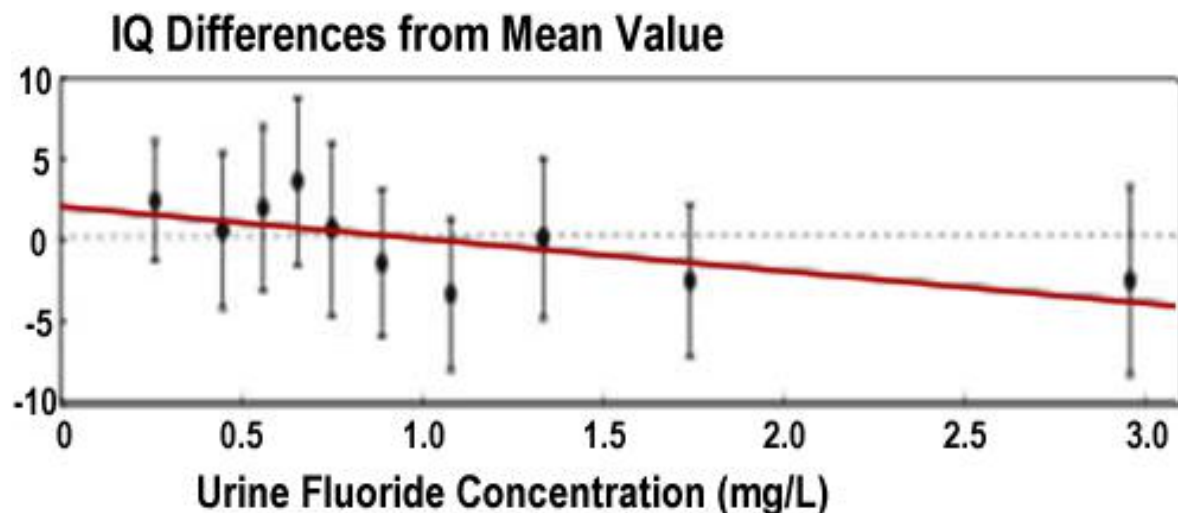
OK, when one looks for this study, one only ever finds the abstract (Li et al 1995) ¹⁰⁰, but never-the-less, this is enough to see that the high fluoride levels associated with a lower IQ must have been very high, as they were associated with medium to severe fluorosis (see the Fluorosis discussion above). This study has been cited by other studies as evidence for lower IQ associated with drinking fluoridated water but usually missing out the “in endemic fluorosis areas” qualification ¹⁰². Other Chinese studies such as Lu et al 2000 ¹⁰³ looked at IQ differences between children in “high” (producing urinary fluoride levels $3.99 \pm 2.57\text{mg/L}$) vs children ingesting “low” fluoride quantities (urinary fluoride levels of 1.43 ± 0.64) and found a mean IQ of almost 11 points below children from a low fluoride exposure area. The low fluoride exposure group, interestingly, had, about the same urinary fluoride level expected from NZ children on fluoridated water and having fluoride toothpaste (so this study supports our fluoridation level as being non-neurotoxic!). That aside, when one looks at the statistical significance of these differences, there is none (the 95% Confidence Intervals overlap). All other Chinese studies referred to also show a lower IQ association only in similarly very high fluoride concentration areas.

2. On another website, a Dr Mercola claimed that “**A recently published Harvard University meta-analysis funded by the National Institutes of Health (NIH) has concluded that children who live in areas with highly fluoridated water have “significantly lower” IQ scores than those who live in low fluoride areas**” ¹⁰¹.

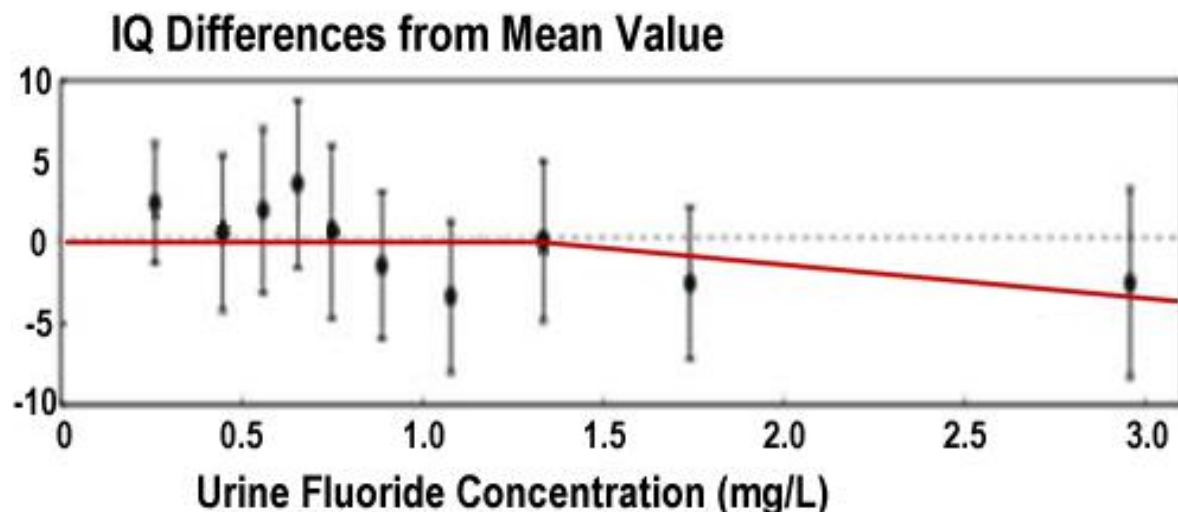
This review (Choi et al 2012 ¹⁰⁴) concluded that children exposed to high fluoride levels had significantly lower IQ scores than those who lived in low-fluoride areas. The high fluoride areas had anywhere from 1mg/L to 11 mg/L, way above found in NZ fluoridated water. Also, as above, the levels of fluoride in fluoridated water in New Zealand would be consistent with the “low fluoride” or “Reference” groups which ranged (where stated) from 0.34 to 1mg/L (mostly 0.8-1) When studies that included co-exposure to arsenic, iodine or coal burning were removed, the IQ difference dropped to 0.29 points, which is hardly startling. Choi et al are careful not to call fluoride a neurotoxin, but recommend that the “potential developmental neurotoxicity of fluoride should be a high research priority”.

The graph on the following page has been used as evidence for an alarming reduction in IQ for exposure to fluoride in the water using a straight line (coloured red by me), supposedly showing a linear reduction in IQ as concentration of fluoride, as measured in the urine, increases.

Leaving aside the fact that urinary measurement of fluoride is a poor indicator of fluoride exposure¹¹⁵, one should note that **all of the 95% confidence intervals overlap**, so this graph actually reveals **NO statistically significant reduction in IQ**. It is misuse of statistics like this that has forced a number of bad decisions in health on the New Zealand public resulting in poorer health outcomes and higher costs than countries that are more evidence based.



Leaving aside the “inconvenient” fact that the “trend” is not statistically significant, despite looking like a trend and that effects above the 1mg/L are not particularly relevant to the current debate, it is possible to draw any number of lines or curves if a non-linear relationship exists, like rising from 0.4 to 0.7mg/L, a rapid fall after 0.7 to 1.2 etc! However, in the two lines interpretation, as drawn on the graph below, one could suggest a trend to reduction in IQ only occurs over 1.5mg/L, although of course, that reduction is not statistically significant!



Choi et al.¹⁰⁴ also cite a study showing that when rat hippocampal neurons were incubated in a petri dish with 20-80 mg/L of fluoride, there were signs of toxicity in those neurons. So if you are a rat, and you are bathing your brain in high concentrations of fluoride, you should be very concerned. However, if you are bathing in municipal water with less than 1 mg/L of fluoride, I'd recommend a long relaxing soak.

It has been claimed that “**Fluoride can affect the brain**”- (Taranaki Daily News April 13 2011)¹¹⁴ and that “**New Plymouth will have fewer geniuses and more "mentally handicapped" people if the town keeps fluoride in its water supply.** Those are the findings of Cambridge University graduate professor of chemistry Paul Connett, a director of the international Fluoride Action Network”¹¹⁴. If the New Plymouth District Council believed that, they either didn’t understand statistics and logic, or admit that New Plymouth people are mentally challenged, having been exposed to fluoridation for the last 40 years!

Reviews:

- At lower fluoride concentrations (eg 0.91 ppm), which are more comparable to the levels in fluoridated water in the UK, a reduction in children’s IQ was not observed (Lu et al., 2000¹⁰³; Zhao et al., 1996)¹¹⁶ ; MRC (UK)¹¹⁵
- SCHER agrees that there is not enough evidence to conclude that fluoride in drinking water may impair IQ. (SCHER 2010)⁹²
- Insufficient evidence on any particular outcome to permit confident conclusions (York Review 2000)¹⁹

I (e) Heart Disease

Recently anti-fluoridation websites have been parroting the A Gucciardi¹²⁷ claim that “**Groundbreaking new research has linked sodium fluoride to cardiovascular disease, the leading cause of death worldwide. Researchers found that fluoride consumption directly stimulates the hardening of your arteries, a condition known as atherosclerosis that is highly correlated with the #1 killer**”¹²⁷

This research (Li et al)¹²⁸ is in fact recent (2012), but far from showing that fluoride causes atherosclerosis, it is a retrospective non-randomised uncontrolled review of 61 patients describing an imaging technique which concludes “sodium [¹⁸F] fluoride PET/CT might be useful in the evaluation of the atherosclerotic process in major arteries” and adds the comment “An increased fluoride uptake in coronary arteries may be associated with an increased cardiovascular risk”. What the anti-fluoride groups fail to realize is that calcium deposition in atherosclerotic arteries will absorb the ¹⁸F isotope and the authors are telling us that PET scans could be a useful way to demonstrate this. Gucciardi’s comment “Reviewing the imaging data and cardiovascular history of patients who received whole-body sodium fluoride PET scans, the researchers found a significant correlation between a history of cardiovascular events and presence of fluoride uptake in coronary arteries” is not saying the fluorine-18 isotope causes the arterial disease but that sodium [¹⁸F] fluoride is the injected marker which their paper is suggesting might be a way to diagnose or monitor the disease, which is less invasive than say, angiography.

This misunderstanding and/or mis-reporting of scientific papers with exaggerated claims of significance is so classic of the anti-fluoride scaremongering approach that I was not surprised to see that Gucciardi’s claims were first published in the unscientific “alternative” Natural Society website and that he confused the fluorine-18 radionuclide used as a source of the positrons needed in Positron Emission Tomography (PET scanning), with the fluoride in drinking water. Any “peer

reviewed” journal or website would have spotted that simple error (well, “simple” for someone with an Advanced Certificate in Radiochemistry like myself).

Gucciardi also fails to understand that fluoride is taken up by calcified tissue (bones, teeth, pineal and atherosclerotic arteries etc) where 99% of the body’s fluoride is to be found ¹²⁹, so the presence of the fluoride in arteries is not the cause but simply the result of the disease.

So is exposure to fluoride in the environment actually dangerous to our heart? Of course it is, claims the anti-fluoride lobby, quoting old (1950s and 60s) studies showing EKG (ECG) abnormalities in populations exposed to high fluoride levels ^{131 132} (so not relevant to the debate). Actual studies of association between heart disease and fluoridation of water supplies tend to show a small reverse correlation, in the order of a 3% reduction in Acute Myocardial Infarctions (heart attacks), as would be expected from the reduction in dental caries (a risk factor for heart disease) ^{133 134 135}.

The American Heart Association states: *“No evidence exists that adjusting the fluoride content of public water supplies to a level of about one part per million has any harmful effect on the cardiovascular system.”*

I (f) Thyroid Disease

The York Review¹⁹ listed three studies in which goitre was the outcome of interest. Two of these studies (Gedalia & Brand, 1963 ¹¹⁷; Jooste et al., 1999 ¹¹⁸) found no significant association with water fluoride level. The third (Lin et al., 1991 ¹¹⁹) found a significant positive association between combined high fluoride/low iodine levels and goitre. However, because this study looked at combined fluoride/iodine uptakes, and has not been published in a peer reviewed journal, the findings should be treated cautiously.

It is claimed that **“Fluoride is/was used to treat hyperthyroidism and so causes Hashimoto's disease”**. The paper referred to was by GALLETTI & JOYET (1958) ¹³⁶ who stated “Prolonged administration of a daily dose of 5-10 mg. of fluoride to patients with hyperthyroidism may cause clinical improvement together with a significant fall in the level of plasma protein-bound iodine and a reduction in the basal metabolic rate.” This “dose” is well above the daily intake of 2mg seen in adults on fluoridated water and using fluoridated toothpaste and so is not relevant. As well, they never mentioned **Hashimoto's disease**. Another claim is that **“Fluoride, such as what is in drinking water and toothpaste, destroys thyroid tissue and may be a primary contributor to the epidemic of Hashimoto's.”** There is no evidence that fluoride in drinking water at 1ppm or less “destroys thyroid tissue” or somehow initiates an auto-immune disease of the thyroid or any other organ!

Recent anti-fluoridation websites claim **“First ever Review of Fluoride/thyroid Toxicology Shows Risk”** and refer to but don’t provide links to the 2006 NRC BEST review “Fluoride in Drinking Water: A Scientific Review of EPA's Standards” ⁸² which reviewed the literature and concluded:

“The available studies of the effects of fluoride exposure on endocrine function have several limitations. In particular, many studies did not measure actual hormone concentrations, several studies did not report

nutritional status (e.g., iodine or calcium intake), and, for thyroid function, other possible goitrogenic factors have not been ruled out. Most studies have too few exposure groups, with, for example, the “high”-fluoride group in one study having lower concentrations of fluoride in drinking water than the “normal”-fluoride group in another study. In general, the human exposures are not well characterized.”

All the studies reviewed appear to be on high fluoride exposure, with urinary fluoride levels all \geq 2mg/L so are unlikely to reflect what happens in fluoridated New Zealanders where urinary fluoride levels would reflect the levels in water and be closer to 1mg/L

Most telling, I believe, is that the risk of goiter and/or reduced thyroid function in many of the studies is thought to be worse if iodine and/or selenium intakes are low. New Zealand has low levels of both of these micronutrients and was one of the first countries to introduce fluoridation. Iodine intake is falling in New Zealand with chefs advising non-iodized salt, yet there has not been a re-emergence of goiter prevalence in fluoridated regions.

I (g) Reproductive and birth defects.

Sources for the eminent journal studies cited for claimed **birth defects** on the FANNZ website ^{3d} are hard to find. Some are bad links but can be found doing **Google** searches, including a self Editorial on *Fluoride*; a JAMA study showing no association; one study of frogs; one on rats (weakly embryotoxic); one broken link to a 1963 French study on Down's Syndrome (showing no association) and one NEJM study (no link but easily found on the Internet), was in fact a 17 year comparison of Massachusetts residents ingesting fluorinated and non-fluorinated water, looking at all births and showing no difference in Down's syndrome – In fact there is **“strong evidence that fluoridation does not cause any important elevation in risk”** ¹²¹ [of Down Syndrome].

Reproductive Defects

The list of studies on claimed **“reproductive effects”** includes studies of animals given toxic doses (not relevant) and eight human studies ⁹⁹. Two cited studies have no links (but relate to high fluoride areas of India); one study is on toxic in-vitro effects of fluoride on ejaculated sperm (showing toxicity only occurs at very high concentrations); one review of an association between high fluoride concentration water and reduced birth rate in US (other factors could explain this); one study showing more menstrual irregularity but not birth rate or outcome change in superphosphate workers (again a correlation only with poorly matched controls), one study showing a fluoride exposure of 3-27 mg/day induces a subclinical reproductive effect; one small Indian study showing decreased testosterone concentrations in skeletal fluorosis patients compared to males drinking the same water (so not related to the water fluoride concentration) as the patients but with no clinical manifestations of the disease.

- Adverse effects of fluoride intake on reproductive performance, such as reduced lactation, have been demonstrated in many species. However, these studies have used dietary concentrations very much higher than those in the fluoridated drinking water of humans (NRC, 1993) ¹³⁸.
- The York Review found no evidence of reproductive toxicity in humans (NHS CRD, 2000) ¹⁹.
- Studies on the association between exposure of mothers to fluoride in drinking-water and adverse pregnancy outcome have shown no increased risk of either spontaneous abortion or congenital malformations. ⁸⁰

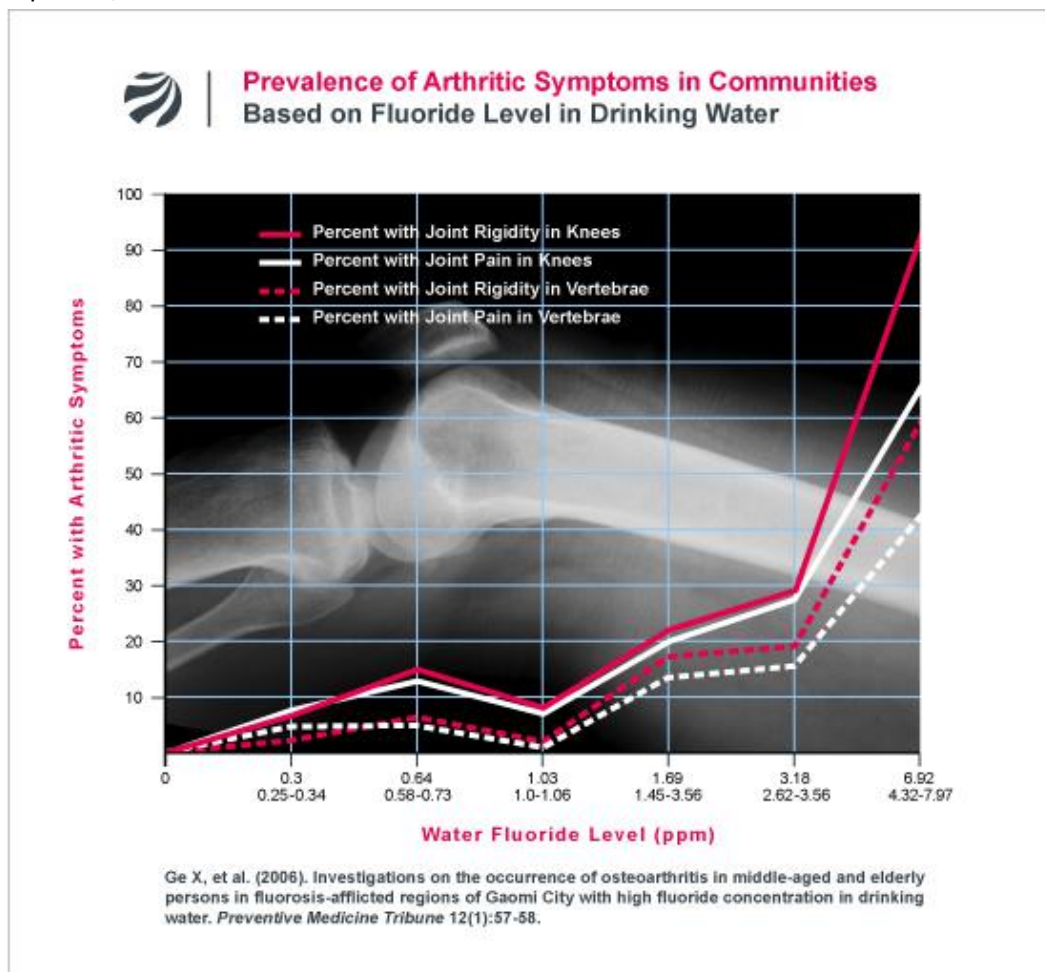
Birth Defects:

- Studies in areas of India and Africa that have high levels of naturally fluoridated water have not shown an increase in birth defects (DHSS, 1991) ¹³⁷.
- Adverse and developmental outcomes occur only at concentrations that are unlikely to be encountered by U.S. [or NZ] populations. 2006 NRC BEST ⁸²

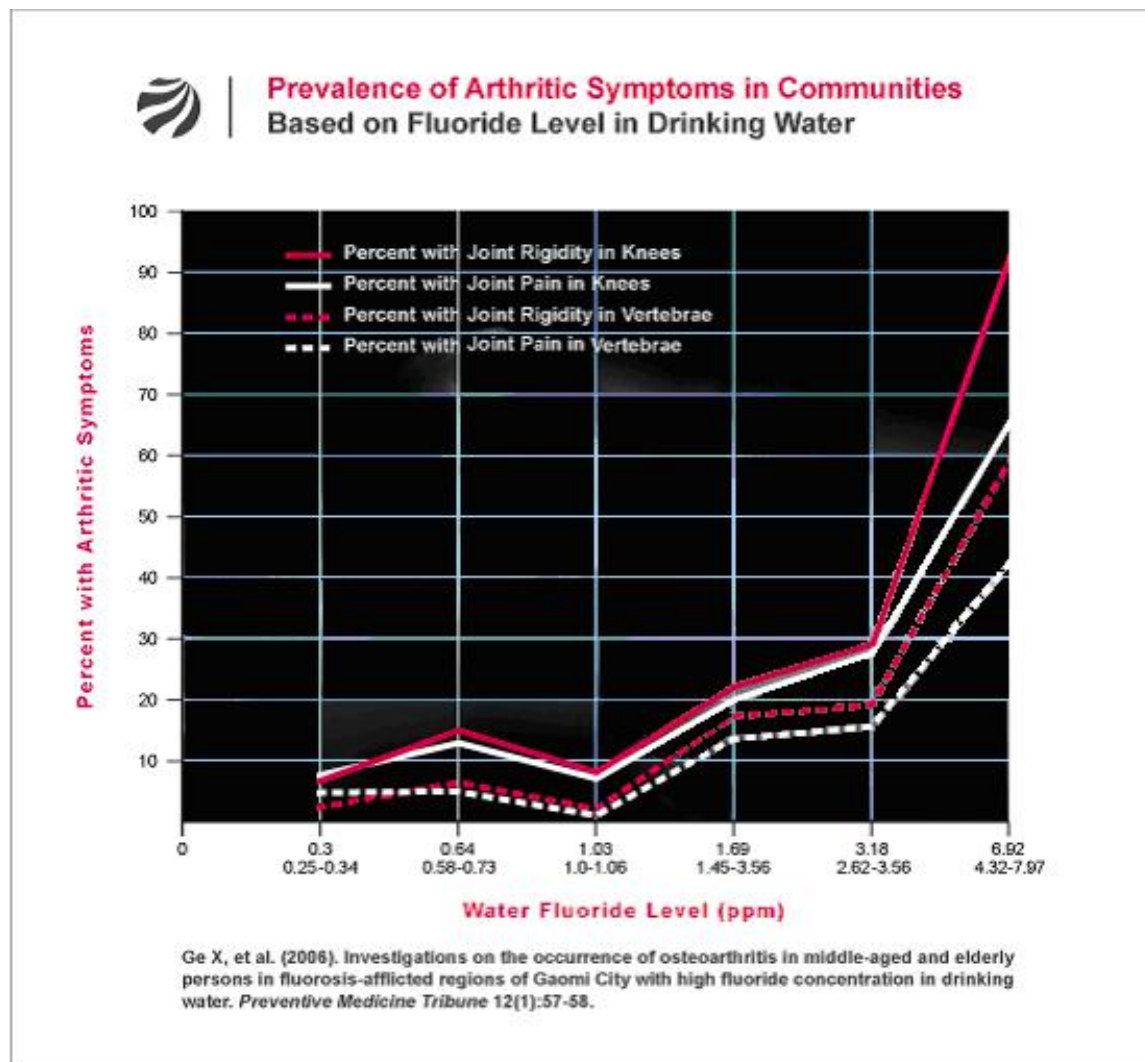
I (h) Arthritis

It is commonly claimed that “Research, however, has now repeatedly shown that fluoride can cause joint pain and stiffness, including frank osteoarthritis” (fluoridealert.org). However, all cited studies that I could follow to source fell into one of the following categories:

- Single case reports of “arthritis cured” by reducing fluoride ingestion {LOE=III-2} ie low level of evidence.
- Self quoting – eg the citing of a paper published in *The Lancet* is actually a letter Cook (1971) wrote describing a single case of a woman ingesting 6 to 9 mg of fluoride per day ¹²⁶. This high level, while under the 10 mg/day UL is still 3-4½ times the expected fluoride intake in for an adult eating typical food, in a fluoridated region of NZ. {mis-information}
- Uncontrolled observational comparison studies with very high fluoride exposure groups (eg with known endemic fluorosis) developing skeletal fluorosis with associated joint pain and stiffness. A daily of 10mg/d is sufficient to trigger crippling skeletal fluorosis (NRC, 1993)¹³⁸. The graph below suggests a near exponential rise in “arthritis” with increasing fluoride exposure, however....



On reviewing the paper, I noticed that there are no figures given for below 0.3mg/L so the graph above should not have had the lines begin at zero. I have redrawn the graph without that error (or blatant misinformation), and it now looks like joint symptoms are static or falling for fluoride concentrations up to 1 ppm, then rise slowly until 3ppm, after which the joint symptom score accelerates. This supports the fact that fluoridation ≤ 1 ppm isn't associated with increased arthralgia.



In following all the studies that purport to show fluoride causes osteoarthritis, it becomes clear that each one is actually describing a form of skeletal fluorosis (which produces joint pain and stiffness) in populations exposed to high levels of fluoride. As high fluoride exposure is very rare in New Zealand none of these studies are particularly relevant to our discussion on the possible harm from exposure to 1mg/L (or ppm) or less.

I (i) Renal Effects

Several large community-based epidemiological studies found no increased renal disease associated with long term exposure to drinking water with fluoride concentrations of up to 8mg/l (DHSS, 1991¹³⁷; NRC, 1993¹³⁸).

The 2006 NRC BEST review "Fluoride in Drinking Water: A Scientific Review of EPA's Standards" ⁸²
Summary on fluoride effect on the kidney is:

"Fluoride in acute and chronic doses can dramatically affect the kidney, but, again, it is the dose that is important. People living in fluoridated areas (at 1.0 mg/L) drinking 1.0 L of water a day will consume 1 mg of fluoride a day (less than 0.014 mg/kg for the average 70-kg person). There are no published studies that show that fluoride ingestion on a chronic basis at that concentration can affect the kidney. However, people living in an area where the drinking water contains fluoride at 4 mg/L who consume 2-3 L of water per day will ingest as much as 12 mg fluoride per day on a chronic basis " and

"Several investigators have shown that patients with impaired renal function, or on hemodialysis, tend to accumulate fluoride much more quickly than normal."

Fluoridation has never been a problem with my patients with chronic kidney disease.

I (j) Immunological Effects

A 1993 paper in *Fluoride* stated "**some individuals exhibit an allergic/hypersensitivity reaction to fluoride**" Spittle ¹³⁹ , but reviews by NRC (1993) ¹³⁸, NHMRC (1991), and Chalacombe (1996)¹⁴⁰ all concluded that the studies undertaken do not support claims that fluoride is allergenic.

The 2006 NRC BEST review "Fluoride in Drinking Water: A Scientific Review of EPA's Standards" ⁸²
note:

- "Various anecdotal reports from patients complaining, for example, of oral ulcers, colitis, urticaria, skin rashes, nasal congestion, and epigastric distress, do not represent type I (anaphylactic), II (cytotoxic), III (toxic complex), or IV (delayed type reactivity) hypersensitivity." and
- "There is no question that fluoride can affect the cells involved in providing immune responses...[but].. Because most of the studies conducted to date have been carried out in vitro and with high fluoride concentrations, Challacombe (1996) ¹⁴⁰ did not believe they warranted attention."

I (k) Pineal Gland Accumulation

This is the real concern of the anti-fluoridation lobby. Descartes considered the pineal as the "seat of the soul" and many (particularly Theosophists) consider it to be the physical "Third Eye" the "ajna chakra" or 6th chakra necessary for spiritual and psychic awareness. As we evolve as multi-dimensional beings the piezoelectric calcite crystals of the pineal gland act as receivers of light and information, but calcification and fluoridation hamper this. Our advancement as spiritual beings and our psychic abilities become blocked!

To back all this new age belief we now have a Doctorial Thesis study by a Jennifer Luke showing that "**human pineal gland contains the highest concentration of fluoride in the body**" and that increased fluoride in the diet accelerated the onset of sexual maturation in the

female gerbil” ¹²³. Now how can we evolve spiritually if we are becoming more sexually active one might ask? This is all very important given the Mayan calendar is about to end!



11 aged (mean 82) human cadavers [5 of whom died of probable cardiovascular diseases] were analysed and she found the mean [F] of pineal gland was significantly higher ($p < 0.001$) than muscle and also that the excretion rate of urinary 6-sulphatoxymelatonin (as an index of pineal melatonin) was collected from two groups of 12 gerbils exposed to low or high fluoride diets (7mg/kg vs 37mg/kg).

- The very high fluoride diet vs the extremely high fluoride diet are not relevant to the water fluoridation debate as there are virtually no circumstances where our fluoride intake would get anywhere near even the controls (low fluoride diet).
- The high levels of fluoride in the aged cadavers is totally expected, given the human pineal naturally calcifies with age (used as a marker in radiology). It has been called the fifth mineralizing tissue since it is one of the rare tissues in the body (along with the choroid plexus) where calcification occurs physiologically. It is a well-known feature and is considered to be a 'normal' phenomenon because it is not usually associated with clinical symptoms.
- It is therefore not really correct for Jennifer to state that the “pineal gland contains more F than any other normal soft tissue” as it has become calcified, and like all other calcified tissue (bones, teeth, atherosclerotic arteries etc), will take up fluoride as it calcifies as demonstrated by the lack of correlation between the [F] in bone ash and pineal gland (wet).
- Contrary to anti-fluoridationist claims, the fluoride found in the human pineal was not more than in bone, but was more than in muscle [mean F (\pm SD) of the pineal,

muscle and bone ash were 296 (± 257)mg/kg, 0.5 (± 0.4)mg/kg and 2,037 (± 1095) mg/kg respectively.

- A significant correlation was found between the [F] and [Ca] of the pineal (wet) using Pearson's correlation test: $r=0.73$: $p<0.02$, consistent with the fluoride being taken up by the calcium, not causing the calcification.
- Fluoride concentration in bones and teeth can be 10,000 times that of that in body fluids and soft tissues ¹²⁴, and this study **just demonstrates that other calcified tissue also takes up fluoride at a higher rate.**
- So basically, her study adds nothing “special” and the fluoride found in the pineal is just a reflection of its natural calcification.

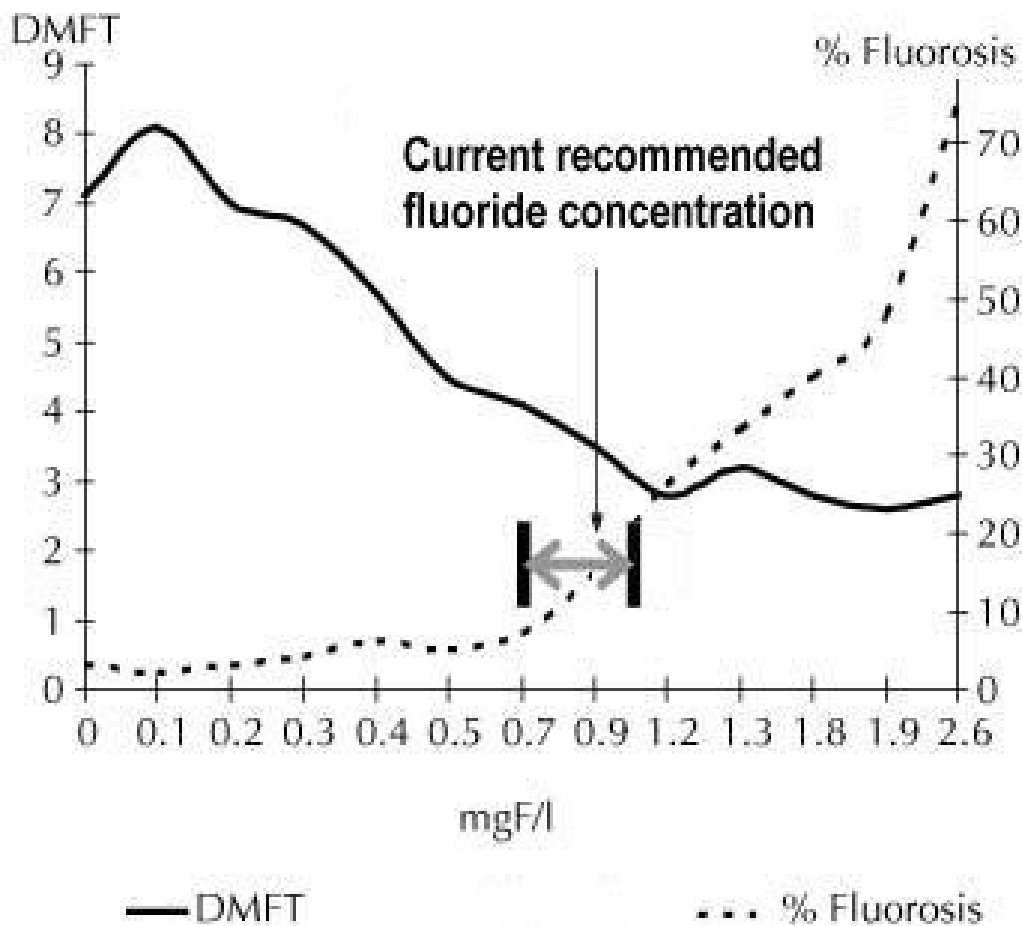
It is not justified for the STDC to withhold the benefits of fluoridation from the folk in Patea and Waverley just because someone wishes to cleanse their 6th chakra in readiness for the end of the period of the fourth sun of the Mayan calendar!

J. Summary and recommendation to the STDC

Because of the efforts of anti-fluoridation campaigners to “bamboozle with pseudo-science” and replace rational thinking with emotion over this health issue, I felt obliged to spend many, many hours on researching the evidence base and can confirm that multiple systematic reviews of literature have confirmed the effectiveness and safety of fluoridation at or below 1mg/L (1ppm), in reducing the common disease dental caries, the treatment for which is often neglected because of access and cost issues ⁷¹. I have also taken considerable time to follow to source the claims of the anti-fluoride lobby on cancer, fractures, reduced IQ etc. I have found that the claims are essentially groundless, with very isolated or often dated studies with little or no strength of evidence combined with considerable parroting of previous disproven claims, misrepresentation of study results, poor understanding of basic science or attempts to link known harmful effects associated with high dose fluoride exposure to potential harm at such a low dose that the quantity of water drunk is hundreds of times more toxic than the 1 part per million fluoride it contains.

Although I have attempted to identify the source and reliability of every objection raised by FANNZ and other anti-fluoridation lobbyists, if there is any reasonable fluoridation concern raised that I haven't investigated, I am happy to be contacted at ktblayney@gmail.com with that concern and I will research that and offer an opinion based on the latest scientific evidence. However, I have already spent innumerable nights and many weekends on this project so I will not waste any more time on issues that have been thoroughly clarified by any recent independent Systematic Review.

Despite the removal of any doubt on important health concerns from fluoridation, there is good evidence of an association of diffuse opacities and/or mild dental fluorosis to fluoride levels as low as 1mg/L, with a rising incidence with increases in the fluoride concentration. There is also concern that formula fed toddlers around 9 to 12 months of age can, in fluoridated areas, ingest enough fluoride to approach the upper recommended level. As significant caries preventive benefits can be achieved and risk of fluorosis reduced at 0.7 mg/L, the lowest concentration in the range of the USPHS recommendation ¹¹², it would be reasonable to explore the possibility of using the newer Recommended Level of 0.7 – 0.8 ppm ^{12 112}. This would reduce the risk of mild fluorosis further, while remaining in the “optimal range” for safe, effective reduction of dental caries – see graph on the following page.



Source: Adapted from Burt & Eklund¹²⁵ (1999)

From the above combined graph, it is possible to see that while the fluoridation level of 0.7-1mg/L is a compromise between safety and effectiveness, and fluorosis (even if minor) only starts to rise above the background level as the fluoride concentration rises above 0.7mg/L, yet there is a substantial reduction in dental caries at that level. Therefore instead of following the FANNZ mantra “**If in doubt, leave it out**” I would suggest as there is no reasonable doubt about effectiveness and overall safety of fluoridation at current concentrations, a more logical and ethical stance for the STDC would be to “Aim for the lowest risk needed to achieve a reasonable benefit” with a more considered quote (instead of a mindless slogan) of “There are risks and costs to action, but they are far less than the long range risks of comfortable inaction.” [John F. Kennedy]

It is my recommendation, therefore that:

1. THE STDC APPROVES THE EXTENSION OF FLUORIDATION TO THE WATER SUPPLY OF PATEA AND WAVERLEY
2. THE STDC AIMS FOR A SOMEWHAT LOWER AND NARROWER RANGE OF 0.7 TO 0.8 PPM FLUORIDE WITH THE UPPER ALLOWABLE AT 1 PPM, INSTEAD OF THE CURRENT 1.5 PPM, FOR THE FOLLOWING REASONS:
 - A. THE LOWER LIMIT IS A REFLECTION OF THE CONCERN ABOUT HIGHER PREVALENCE OF DIFFUSE OPACITIES OR DENTAL FLUOROSIS POSSIBLE AT HIGHER CONCENTRATIONS AND

- B. THE LOWER LIMIT IS ALSO A REFLECTION OF THE POSSIBILITY THAT BOTTLE FED TODDLERS MAY APPROACH THE RECOMMENDED UPPER SAFE LIMIT, PARTICULARLY IF THEY ARE GIVEN AND SWALLOW ADULT STRENGTH FLUORIDATED TOOTHPASTE.
3. THE STDC CONSIDERS USING THE LOWER LIMIT IN THE HĀWERA WATER SUPPLY, FOR THE SAME REASONS
 4. THE STDC CONSIDERS EXTENDING FLUORIDATION TO MANAIA, ELTHAM, ŌPUNAKE AND OTHER COMMUNITIES, PARTICULARLY THOSE OF LOW DECILE RATING.
 5. FINALLY THE STDC CONSIDERS COMMISSIONING, ALONG WITH THE TARANAKI DISTRICT HEALTH BOARD, A WELL DESIGNED PROSPECTIVE, CONTROLLED “PRE- AND POST- FLUORIDATION” STUDY IN CONSULTATION WITH LOCAL DENTISTS AND DENTAL THERAPISTS TO MONITOR THE EFFECTS OF FLUORIDATION ON ALL THE CHILDREN OF PATEA AND WAVERLEY, BOTH FOR THE LEVELS OF DENTAL CARIES AND STANDARD INDICATORS OF DIFFUSE OPACITIES AND FLUOROSIS, ALONG WITH RECORDING ANY OTHER APPROPRIATE VARIABLES SUCH AS SOCIO-ECONOMIC LEVEL, USE OF FLUORIDATED TOOTHPASTE ETC. THE CONTROLS WOULD BE NOT JUST THE PRE-FLUORIDATION PATEA AND WAVERLEY CHILDREN BUT A SIMILAR SIZED HĀWERA SAMPLE (LONG TERM FLUORIDATION), [SIMILAR TO PRYOR 2012] AND ANOTHER SIMILAR SIZED NON-FLUORIDATED GROUP FROM MANAIA AND ELTHAM AND PERHAPS ŌPUNAKE (NON-FLUORIDATED NEARBY SMALL TOWNS). THIS WOULD BE USEFUL, NOT JUST FOR THE STDC’S FUTURE DECISION MAKING, BUT TO CONTRIBUTE TO DECISION MAKING BY OTHER TERRITORIAL AUTHORITIES. **IT IS NOT OFTEN THAT AN AREA BECOMES FLUORIDATED, SO THIS IS AN OPPORTUNITY WE SHOULD NOT MISS.**

Full colour version: www.drblayney.com/Blayney-Fluoride.pdf

K. Appendices

Appendix 1: Further information on interpreting evidence

[a] Systematic Review meta-analysis and RCT

“The purpose of a **systematic literature review** is to evaluate and interpret all available research evidence relevant to a particular question. In this approach a concerted attempt is made to identify all relevant primary research, a standardised appraisal of study quality is made and the studies of acceptable quality are systematically (and sometimes quantitatively) synthesised. This differs from a traditional review in which previous work is described but not systematically identified, assessed for quality and synthesised.”⁴⁷

A “**meta-analysis**” is a systematic analysis that combines data to give “increased power” over smaller studies alone. Observing similar effects over different settings and/or designs makes the results more robust and transferable, while inconsistent results can be examined to look for sources of variation or evidence of non-reliability of the effect. These are time consuming averaging 30 person-weeks.

A **Randomised cross-over trial** involves having subjects being measured before and after exposure to different interventions (or placebo) which are administered in a random order (and usually blinded, which can

be “double-blinded”, ie subject and observer both unaware which is the intervention group or “single-blinded”, with only the subjects unaware, in order to eliminate or reduce bias).

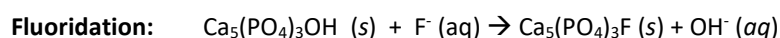
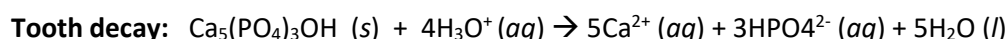
[b] The **US Centre for Evidence-Based Medicine** (CEBM) uses a slightly different table to identify the different levels of evidence:

The Centre for Evidence-Based Medicine	
Level	Description
I	Evidence from at least one properly designed randomized controlled trial.
II-1	Evidence from well-designed controlled trials without randomization.
II-2	Evidence from well-designed cohort or case-control analytic studies, preferably from more than one center or research group.
II-3	Evidence obtained from multiple time series with or without the intervention. Dramatic results in uncontrolled trials might also be regarded as this type of evidence.
III	Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees.

The U.S. Preventive Services Task Force also uses a slightly different Grades of Recommendation scale ²¹ but as it hasn’t done a systematic review on fluoridation, I haven’t included this.

Appendix 2: Basic fluoride Information relevant to this submission

Action of fluoride on teeth: Floridation works by replacing some tooth hydroxyapatite ($\text{Ca}_5(\text{PO}_4)_3\text{OH}$) with fluoroapatite ($\text{Ca}_5(\text{PO}_4)_3\text{F}$). This Fluoroapatite is more resistant to acid attack and thus teeth which contain even a small proportion of fluoroapatite are less likely to decay. The relevant reactions are as follows:



Adequate Intake (AI) of fluoride: The average daily fluoride intake (mg/day) recommended for optimum caries prevention based on observed or experimental estimates. See “**Oral intake**” below.

DMFT: Average number of **Decayed**, **Missing** (extracted) and/or **Filled Teeth** per child

Fluoride: The fluoride ion F⁻ is a fluorine atom (Atomic Weight = 19) which has acquired an extra electron giving it a negative charge. It makes up only part of a molecule such as Sodium Fluoride (NaF) which has a Molecular Weight of 42 so F is only 45.2% ($19 \div 42 \times 100$). Similarly Calcium Fluoride (CaF₂), ► MW of 78.1 is 48.7% F [$2 \times 19 \div 78.1 \times 100$] and HFA (H₂SiF₆) ► MW of 144.1 is 79% F [$6 \times 19 \div 144.1 \times 100$].

The measurement of fluoride in water / food / tissue can be given as:

- mmol/L (Millimoles per litre). [1 mmol fluoride/L=19mg/L];
- ppm (parts per million) [1ppm=1mg/1,000g=1mg/l]
- g/m³ (grams per cubic metre) [1 g/m³ =1,000g /1,000L=1g/L]
- mg/L (Milligrams per litre)

Under normal conditions when 1 millilitre of water weighs 1 gram, so fluoride levels in water may be given at 1ppm = 1mg/L = 1g/m³ - which of course is why we use the metric system!

Lethal dose, median (LD₅₀): or “lethal dose, 50%”, is the amount of a substance required to kill half the members of a tested population after a specified test duration. While the LD₅₀ (the dose where 50% of people would die) is not known for HFA (any volunteers for the trial?), the oral LD₅₀ for rat is 430mg/kg. Elsewhere one finds figures of 70mg/kg (mouse) and 200mg/Kg (Guinea Pig) but **Haneke and Carson** [Review of Toxicological Literature Oct 2001³⁶] state fluorosilicic acid has “A probable oral lethal dose of 50-500 mg/kg, classified as very toxic, has been reported for a 150-pound (70-kg) person”.

Lethal Dose, Low (LD_{Lo}): is the lowest dosage per unit of bodyweight (in milligrams per kilogram) of a substance known to have resulted in fatality in a particular animal species (usually ingested, as LD_{Lo} is usually much lower intravenous or even inhaled. The LD_{Lo} for fluorosilicic acid is 50mg/kg for a 70kg man, giving the fluoride LD_{Lo} so as 39.5 [6×19 (AW of F) divided by 144.1 (MW of H₂SiF₆) $\times 100 \rightarrow$ fluoride=79% of HFA weight]. The LD_{Lo} for sodium fluoride (NaF) is 5-10g, giving the LD_{Lo} for fluoride as 32-64mg/kg, so 40mg/Kg is about right.

Based on the deaths of four children ingesting fluoride in dental products one writer (Whitford, 1992) estimated the “probably toxic dose” of fluoride at only 5 mg /kg ⁴⁶.

Toothpaste: “**A seven ounce tube of toothpaste, theoretically at least, contains enough fluoride to kill a small child**” is a frequently used quote that originates from the extremely unscientific book “Fluoride the Aging Factor”. Most fluoridated toothpastes on sale in New Zealand are around 100g (not the 7oz=200g quoted) and contain 1000 ppm of fluoride while “Junior” toothpastes are generally reduced in size to 45g and in strength to 400ppm of fluoride. The 110g tube of adult *Sensodyne* has 2.21mg/g = 243.1mg of NaF ($\times 19/42$ =**110mg fluoride**). The old 90g tube of *Colgate Fluoride for Kids* has 0.76% Sodium Monofluorophosphate = 683mg Na₂PFO₃ ($\times 19/144$ =**90.25mg fluoride**) while the newer 45g tube of *Colgate Junior Fluoriguard* has 0.304% Na₂PFO₃ = 136.8mg ($\times 19/144$ =**18mg fluoride**). Using the 50mg/kg lethal toxicity figure, a 10kg child would need to eat 28 tubes of *Colgate Junior* or 5½ tubes of normal adult toothpaste or 2½ 200g tubes to get 50x10=500mg. A single 200g tube alone could kill a 4kg new born baby but they don’t tend to pick up tubes of toothpaste and eat them. A slightly older 5kg baby fed a whole *Colgate Junior* by an older sibling would not even reach the 5mg/kg toxicity figure proposed by Whitford ²⁸. Maths and parenting aside, we are actually debating fluoride in water at 1 ppm, not toothpaste at 1000 times the strength.

Oral intake of fluoride from sources other than fluoridated water in NZ or specifically, Patea and Waverley:

The current “natural” fluoride level in the non-fluoridated water:

- Patea = 0.20 – 0.22 ppm
- Waverley = 0.06 – 0.07 [Taranaki Public Health Service]

Adequate Intakes (AI) & Upper Levels of Intake (UL) for fluoride ⁵³			
Life Stage Group	AI (mg/day)		UL (mg/d)
	Male	Female	
0– 6 months (Human milk)	0.01#	0.01#	0.7
7–12 months	0.5	0.5	0.9
1–3 years	0.7	0.7	1.3
4–8 years	1	1	2.2
9–13 years	2	2	10
14–18 years	3	3	10
19–>70 years	4	3	10
Pregnancy			
14–50 years	-	3	10
Lactation			
14–50 years	-	3	10

the AI for the 0–6 month age group is based on the average consumption of breast milk (780 ml/day) and the average concentration of fluoride in the breast milk of mothers in areas with fluoridated water (0.013 mg/l)

So what do we actually consume?

Estimated dietary intake of fluoride for New Zealanders ^{53 54}						
Age	Guideline Levels (mg/d)		Mean estimated dietary fluoride intake [mg/d] (95th percentile)			
	AI	UL	Total Diet		Dietary Modelling	
			Fluor. water	Unfluor. water	Fluoridated water	Unfluoridated water
6–12 month	0.5	0.9	0.71	0.18		
1–3 yr.	0.7	1.3	0.57	0.25		
5–6 yr child	1	2.2	0.86	0.36	0.83 (1.74)	0.38 (0.73)
7–10 y child	1–2	2.2–10			0.99 (1.80)	0.45 (0.82)
11–14y ♂	2–3	10			1.26 (2.34)	0.61 (1.09)
11–14 y ♀	2–3	10			1.03 (2.09)	0.49 (1.00)
15–18 y ♂	3	10			1.89 (3.53)	0.86 (1.88)
15–18 y ♀	3	10			1.68 (3.27)	0.73 (1.41)
19–24 y ♂	4	10	1.37	0.80	2.25 (4.28)	0.98 (2.09)
19–24 y ♀	3	10			2.03 (4.03)	0.88 (1.87)
25+ yr ♂	4	10	2.10	1.12	2.50 (4.60)	1.26 (2.52)
25+ yr ♀	3	10	2.07	0.98	2.35 (4.52)	1.04 (2.16)

Fluoride in Toothpaste. Calculations based on the use of 1,000mg F/kg toothpaste, the average added consumption of Fluoride from toothpaste for 3-4 year olds is 0.23mg/day and 0.3mg/day for 1 year olds.

- The UL was exceeded by less than 0.1% of respondents up to 10 years of age, based on an unfluoridated water supply, and by approximately 0.8% of respondents, based on the scenario of a fluoridated water supply, using dietary modelling.
 - In infants around 9 months, fluoridation at 1mg/L can result in intake exceeding UL if high fluoride toothpaste is used and swallowed.
 - In adolescents in fluoridated areas (and despite fluoride in diet and toothpaste), intake is below AI, even if consuming high fluoride products like tea, soft drinks, milk and beer (now that covers all social classes!)
 - Adults (over 19) are well under AI. Women in fluoridated areas brushing with fluoride toothpaste almost get their AI, guys probably need to drink more tea or beer!
-

P-value and Significance: When used in statistics *significant* does not mean *importance*. A result is **statistically significant** if statistical testing has determined a low probability it could be the result of chance. The *p*-value is the probability of obtaining a test statistic at least as extreme as the one that was actually observed. So a *p*-value of 0.05 or more commonly 0.01 is about as high as one would reasonably begin to accept significance. A much lower value, say *p* = 0.001 would be highly significant. To obtain a significant *p*-value for a small effect, most studies require large subject numbers.

Upper Levels of Intake (UL): The highest average daily nutrient intake level likely to pose no adverse health effects to almost all individuals in the general population. See “**Oral intake**” above.

Appendix 3:

Local (South Taranaki) and National FANNZ advocates

South Taranaki

The local Fluoride Action Network representative (“campaign contact” ⁴), Helen Curtin, states she is a “Nutritional Therapist”, (a branch of Naturopathic / Complementary Medicine) holding a Diploma in Nutritional Medicine (UK) [see her biography ⁷]. Her definition of “Nutritional Therapy” is “the use of food education and supplementation to re-balance the body to achieve optimum health”. However, Nutritional Therapy has been strongly criticized for its unscientific with often dangerous advice and is quite different to advice from qualified Dietitians who hold scientific degrees and are required to be registered and be evidence based. Unregistered Nutrition Therapists have recently been criticized in the UK ⁸.

New Zealand Websites

I have looked at the Online claims by Fluoride Action Network ³ and Fluoridation-free NZ Coalition ⁴ about evidence from prestigious journals (such as The Lancet). Their references often give the same incorrect or bad link and give the same misreading of the paper suggesting the authors are just

copying someone else's error, rather than looking at the original paper. Additionally, when discussing medical information, it becomes clear that there is a lack of basic medical knowledge by "the author" of the FANNZ.org.nz website. When, for example, he gives the following commentary on Fluoride "allergy": - ***Allergic individuals** - To take peanuts as an example, some individuals go into anaphylactic shock with the merest trace of peanut intake. Personally I (the author) can tolerate a taste or two of peanut satay, but a meal of it would make me vomit*^{3a}. Allergic reactions do not in fact have a "dose-response relationship" revealing a lack of understanding by "the author" between "allergy" and "intolerance".

Other FANNZ spokespersons

Anti-fluoride speakers to the STDC 2012 Draft Long Term Plan, Jeanette Wilson and Stephen Barrett were quoted in the Taranaki Daily News ⁹ as having a "Fiery debate". The article states "Councillor Peter Johnson asked her [Jeanette Wilson] how many statistics she had from South Taranaki dentists. Mrs Wilson said dentists were often "not correct" and better care for teeth could be found in proper nutrition and education. Mr Barrett said a recent survey of South Taranaki paediatricians and dentists was "laughable" and could not contribute to any scientific debate." STDC members who received copies of submissions to the draft Long Term Plan on fluoridation will know that the "recent survey of South Taranaki paediatricians" was actually a submission from six consultant Taranaki Paediatricians and one Paediatric Advanced Trainee who simply (and correctly) stated that dental decay is the most prevalent disease in New Zealand with ethnic and socioeconomic disparities and that water fluoridation contributes to reducing inequalities in oral health status, giving references to the New Zealand reviews on these subjects. So here we have unqualified speakers claiming 100% of dentists in South Taranaki are wrong and that specialist Paediatricians quoting Level I evidence are not qualified to have a scientific debate?? Their dismissal of evidence based dentistry and medicine is not laughable, it is very dangerous if taken seriously. However it should help demonstrate that the STDC should regard their "evidence" skeptically and it certainly makes their arguments appear "crackpot" and of little substance.

Appendix 4: Tactics used by anti-fluoridation campaigners

Edited graphs and NZ examples added by myself

[a] Gross Misrepresentation

As mentioned, I am most concerned at the misrepresentation by FANNZ of important studies, as well as their use of tactics listed below by ARMFIELD ¹¹.

The vast number of different studies from overseas can certainly be confusing if their LOE is not considered or their relevance to the Fluoride levels to be used is not considered, such as studies where the Fluoride level in the water is 5-20 times the 1ppm (1mg/L). However, there is no excuse for misrepresenting the New Zealand studies on appropriate levels of fluoridation and making false claims about them in order to trick decision makers.

The most blatant local example of this is where the author of the FANNZ website states ***The last two studies on dental health carried out in New Zealand were in Auckland in 2008 and***

Southland in 2005. Both of these studies found no difference in decay rates but a doubling of dental fluorosis from 30% in fluoridated areas to around 15% in non-fluoridated areas.”^{3b} **This is just not true.**

- Firstly, a thorough pre- and post-fluoridation study of Northland children comparing both pre and post fluoridation dental caries in two towns initiating fluoridation (Kaitaia and Kaikohe) with the non-fluoridated towns of Dargaville (similar decile to Kaitaia) and Moerewa & Kawakawa (similar deciles to Kaikohe) was reported in 2009¹⁴ involving all 5-6 year old and 12-13 year old children totalling over 1,000 children. The study concluded *“Water fluoridation benefits are usually seen after 5 years, but in this instance there were some beneficial effects observed in a high-risk population within two years of water fluoridation despite the less-than-ideal implementation of the community water fluoridation intervention. The study concludes and reiterates that **water fluoridation is effective** in reducing smooth surface carious lesions, especially in a child population with rates of dental caries which are extremely high by modern standards.”*
- Secondly, the Auckland 2008 study while showing a double rate of “diffuse opacity” (not specifically “fluorosis”) also noted that this hadn’t changed in 25 years, actually reported that **“conversely, the prevalence of deciduous teeth dental caries was significantly lower in fluoridated areas (54.9 per 100) than in non-fluoridated areas (62.0 per 100), P=0.05”**¹³. That is a significant difference in decay rate.
- Finally, the Southland 2005 study¹⁴ also shows an increase in diffuse opacities among children who have lived their whole lives in a fluoridated area **“but this has not increased”**. The authors conclude **“The benefits of water fluoridation as a public health measure remain, with children continuously exposed to fluoridated water during their life having half the dental caries experience of those who have not.”** Again “half the dental caries” is NOT “no difference” !

So putting aside the impressive Northland 2009 study {LOE=II-1} which the FANNZ author may not have known about (but more than likely did but ignored it), the two studies he did cite show **almost the opposite of what is claimed** with significant reductions in dental caries in the fluoridated populations {LOE=II-2}. The dental fluorosis claim was actually “diffuse opacities”, considered by many to indicate only mild enamel fluorosis of little aesthetic importance, although assessment of the severity by current methods is difficult^{15 16}. However, a large national survey in Ireland (with 28 years of fluoridation in many areas by the time of the study) revealed “The prevalence of enamel fluorosis/defects was found to be similar in children living in fluoridated and non-fluoridated areas in Ireland but the prevalence of diffuse opacities (DDE) was higher in the fluoridated areas¹⁷ suggesting that the “diffuse opacities” seen in NZ studies cannot be interpreted to mean significant or even “moderate” enamel fluorosis (which is rare in Australia and New Zealand).

Another technique of misrepresentation is the misuse of graphics to give a false perception. It could be showing part of a graph or not starting at zero giving the impression of a significant change or difference, when there is not a statistically significant one. See the cancer graphs in the body of the submission.

[b] Other tactics (including common old garden Misrepresentation)

As mentioned, while I am most concerned at the **gross misrepresentation** by FANNZ of important studies, it is important to be aware of other tactics used to influence lay Councils used particularly in Australia and New Zealand. I have listed some of these below as identified by Jason ARMFIELD of the Australian Research Centre for Population Oral Health, School of Dentistry, University of Adelaide¹¹, edited by me and some NZ examples used.

Denying the benefits of water fluoridation:

True scientific debate over water fluoridation was resolved decades ago. Almost all major dental and health organisations either support water fluoridation or have found no association between it and adverse health effects. As far back as 1978, *Consumer Reports* concluded: "The simple truth is that there's no "scientific controversy" over the safety of fluoridation. The practice is safe, economical, and beneficial. The survival of this fake controversy represents, in Consumers Union's opinion, one of the major triumphs of quackery over science in our generation."¹⁸

However, arguments that "new evidence" shows that water fluoridation is either not effective or, at best, only minimally effective continue and are believed by those unaware they have been refuted. It has even been argued that water fluoridation actually harms teeth, making them more susceptible to caries. These claims have been adequately addressed with numerous systematic reviews **{A Grade Rec}** published in leading peer reviewed journals^{19 20} finding that water fluoridation is associated with improved oral health and is safe.

Selective reporting of studies

Each year hundreds of studies are published in the scientific literature regarding the effects of fluoride on animals and humans. In order to examine a relationship between variables across an extensive body of literature scientists often make use of literature reviews or meta-analyses. Water fluoridation opponents, however, take a contrary approach. Rather than trying to discern a given outcome for fluoride exposure across all available studies, they handpick studies to cite. Findings not supporting their viewpoint are entirely disregarded while other findings may be prominently utilised.

Selective reporting of results

To make the selective reporting of studies even more misleading, often specific results within specific studies are reported while any disconfirming results are ignored.

New Zealand examples of this are described above under "**Gross Misrepresentation**".

Downplaying or ignoring the evidence

Water fluoridation opponents claim that there is either no 'significant' or no 'substantial' reduction in tooth decay resulting from exposure to fluoridated water. Of the studies cited showing no difference, many simply compare one community with another without any control for other possible variations between those communities¹⁰. The quoted studies and reviews contain no "A Grade" recommendations.

Reductions of "a fraction of one decayed tooth per child" are dismissed as not substantial.

In fact water fluoridation is a population-level caries preventive strategy and reductions of between 20% and 50% have elsewhere [eg New Zealand^{12 13 14}] been commonly reported. Differences of between 32% and 55% in the deciduous teeth and 20% and 65% in the permanent teeth have been reported in Australia²², but even the "fraction of one tooth" studies represent a huge reduction in the population. "A difference in decay experience between fluoridated and non-fluoridated areas of 0.7 teeth on average might be dismissed by anti-fluoridation lobby groups as 'meagre'²³ but if this finding was extended across the Australian child population of 1.8 million children, it would translate into over a million teeth saved from decay.

Using ecological comparisons

Here the decay experience of children in a specific fluoridated area is compared unfavourably to that of children in a specific non-fluoridated area. Despite such ecological comparisons providing a poor level of evidence due to their inability to take into account other variations between the areas which are also related to dental health (such as differences in diet, socio-economic status, exposure to discretionary fluorides, and oral health behaviours) this type of 'evidence' has been frequently used to shore up the arguments of water fluoridation opponents. The Northland study specifically controlled for these variables and was one of the few "pre and post fluoridation" studies with matched non-fluoridated towns as controls¹².

Fear mongering

One of the easiest ways to preserve the status quo is by raising potentially dangerous or fearful consequences associated with possible change. Fluoride exposure has been linked in the antifluoridationist literature to poisonings and various accidents, allergies, brain dysfunctions such as Alzheimer's disease, hyperactivity, low intelligence, arthritis, bone diseases including hip fractures and osteosarcomas, cancers, dental fluorosis,

gastrointestinal problems, diseases of the kidney, pineal gland and thyroid gland, reproductive issues, AIDS, and even with increased tooth decay, all without good evidence ^{24 25}.

Other recently raised fearful outcomes have been birth defects, perinatal deaths, spreading toxic waste and attempts to control or “dumb down” the population, or some other conspiracy with big business. The sub-title to Connett et al’s 2010 “The Case Against Fluoride” is classical - “How Hazardous Waste Ended Up in Our Drinking Water and the Bad Science and Powerful Politics That Keep It There” ²⁶

The issues raised by local anti-fluoridationists are discussed in the “Risks” section of this my submission.

Misrepresentation of the truth

Misrepresentation involves taking information out of the context in which it is presented in order to make it support a viewpoint which the author or authors did not intend. Statements are taken out of context, and results are selectively reported. For example, in Australia, opponents of water fluoridation make the false claim that the National Health and Medical Research Council (NHMRC) recommends “that NO additional fluoride be given to children under three years” whereas the NHMRC actually recommends that no fluoride supplements (tablets or drops) be given to children under three years of age.

Misrepresentation often takes place by omission. Connett ^{26 27 27}, for example, has regularly cited a study from China ²⁹ as finding a doubling of hip fractures when people consume water with 1.5 ppm fluoride and a tripling of fractures when consuming water of greater than 4.3 ppm fluoride. This is cited as evidence of the deleterious effect of water fluoridation on the bones.

I have looked at the original paper and include two graphs from it to demonstrate his misrepresentation. What Connett does not state is that the doubling of hip fractures at 1.5ppm is not statistically significant nor does he state that it is not increased from the lowest fluoride level group (0.25-0.34ppm) to the level in fluoridated water (1.00-1.06)!

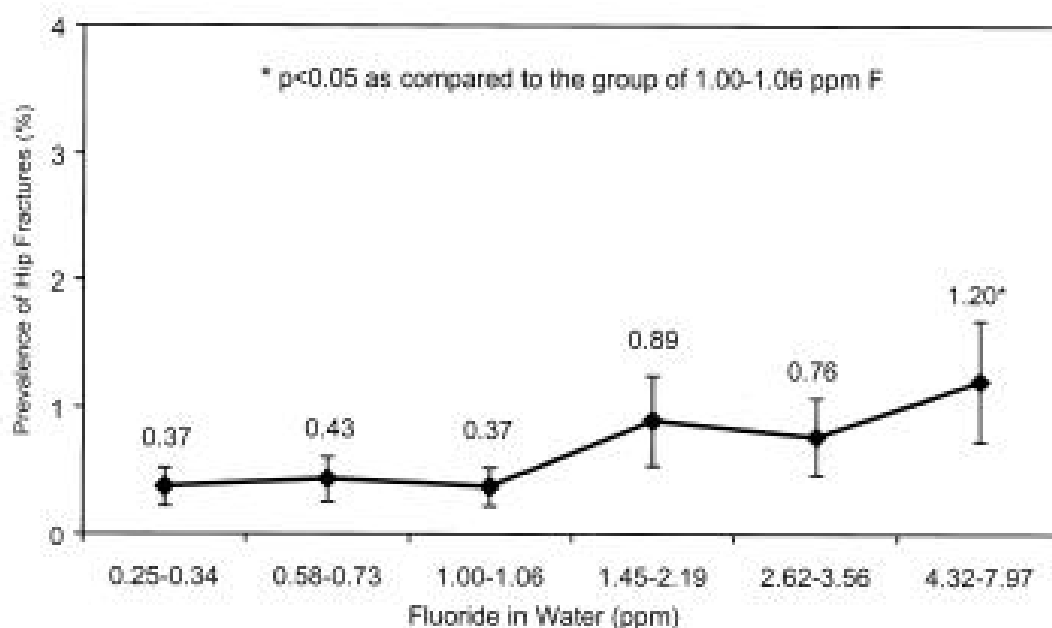


FIG. 3. Prevalence of hip fractures and fluoride concentration in drinking water in six Chinese populations since the age of 20 years.

Connett also fails to mention that the authors' found a 'U' shaped relationship between the amount of fluoride in the water and fractures, with optimally fluoridated water (1.00-1.06) actually conferring a protective effect on bone fractures.

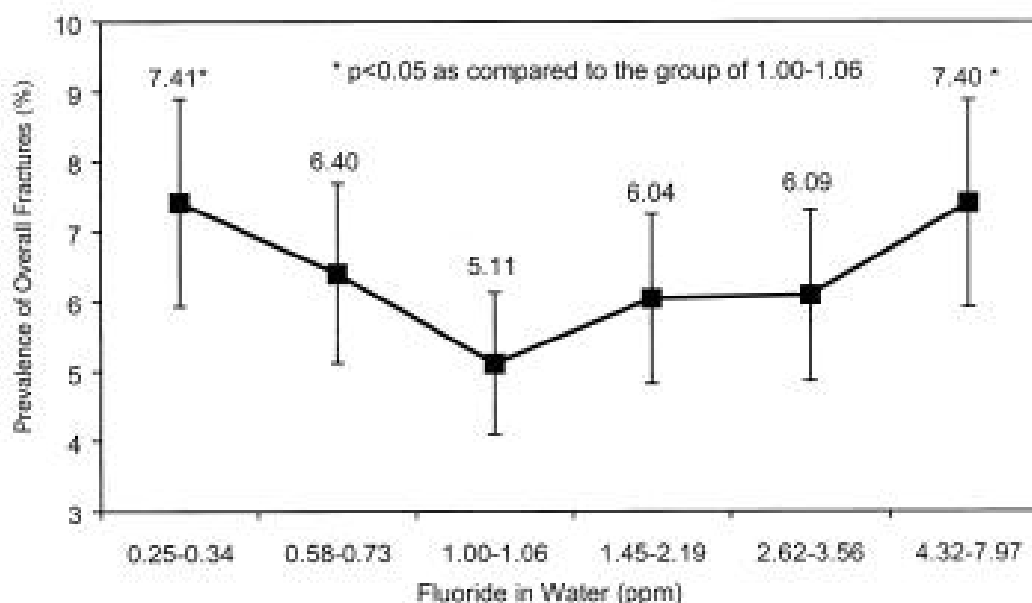


FIG. 2. Prevalence of overall fractures and fluoride concentration in drinking water in six Chinese populations since the age of 20 years.

The big lie

This technique involves telling a lie so large that it defies anyone to believe that someone would distort the truth to such an extreme extent, and is aided in its effectiveness by constant repetition. Research findings indicate that if something is said often enough people will tend to think there is some truth in it, a process now called the illusory-truth effect ³⁰. A similar technique is the 'laundry list' approach, listing so many 'evils' that even if water fluoridation proponents can adequately respond to some they can not address all.

Half-truths

A half-truth is a statement that is only partly true and is generally intended to deceive. The most obvious example is the constant reference to Fluoride being toxic (which it is at high levels), but so is almost everything (water, salt etc). The issue of dosage and its relationship to toxicity is rarely mentioned in antifluoridationist rhetoric because it undermines the intended link between water fluoridation and harm. Another example is the pseudo-scientific question "Did you know that sodium Fluoride is one of the basic ingredients in both Prozac, Sarin Nerve Gas, rat poison?" ⁸⁶ Warfarin, an anti-coagulant which is the active ingredient in the common rat poison, is regularly used as an anticoagulant to prevent strokes and pulmonary emboli from Deep Vein Thrombosis. The toxic Sarin gas mentioned contains not just fluoride but oxygen, hydrogen and carbon (C₄H₁₀FO₂P), as does Fluoxetine (Prozac), which also contains nitrogen (tut, tut) C₁₇H₁₈F₃NO. The fact that a given substance is toxic does not mean that every element contributing to it is also toxic.

Innuendo

Innuendo involves an indirect or subtle, usually derogatory, implication in expression. Water fluoridation is linked by anti-fluoridationists to a number of dangerous and now controversial practices in an attempt to discredit it by association. Statements such as "When the truth about fluoridation is finally exposed, it may well dwarf the thalidomide tragedy", attributed to Albert Schatz and published by the New Zealand Fluoride Action Network. Other implied associations are plutonium; school segregation; human experimentation; atmospheric H-bomb testing and DDT. Why don't they associate Fluoridation of drinking water with the other nine Public Health Achievements of the 20th century which are thought by the CDC to have added 25 years (of the 30 year increase) to the life expectancy in the USA? The other nine are Motor Vehicle Safety; Safer workplaces; Control of infectious diseases; Reduction of Coronary Deaths, Safer & healthier foods, Family

Planning, Recognition of the dangers of tobacco and Vaccination ³¹. Could it be because many local anti-fluoridationists also reject vaccination and other proven public health achievements?

Follow the leader

Opponents of water fluoridation, despite arguing that water fluoridation should not be introduced just because other areas have implemented it, argue that it should be rejected in Australia and New Zealand in the same way that it has been allegedly rejected by much of Western Europe, listing a whole bunch of countries. This is not logical because a similar list of first world countries using fluoridation can be given and non-fluoridating countries have not rejected the benefits or science of water fluoridation but have not introduced water fluoridation for a range of other reasons, such as cost and the use of other population preventive practices such as salt fluoridation.

Enforced medication

The "enforced medication" or "mass medication" argument is that fluoride is a medicine, taking medicine should only be a function of individual choice, and therefore water fluoridation is an impingement on our freedom of choice. Use of the term medicine implies something which should only be administered by a doctor acting for the good of an individual. This is not correct because Fluoride only appears in the Standard for the Uniform Scheduling of Drugs and Poisons as a schedulable substance when used in amounts of more than 1,000ppm. At the 1ppm found in most fluoridated water, Fluoride is not a medicine but an additive, like iodine to salt and folate to bread (planned introduction in NZ). Most breakfast cereals, Marmite and other processed food has numerous additives which are far less beneficial to health than fluoride and have evidence for toxicity at quite low levels (like all fat soluble vitamins), but these are not considered "mass medication".

Of course those motivated to object to having Fluoride in their water are far more able to afford the extra cost of dental care they may face by using defluoridation methods or collecting non-fluoridated water than the socioeconomically challenged people of Patea and Waverley, aside from those not living in South Taranaki.

Bamboozling with science

Anti-fluoridation literature attempts to overwhelm readers with claims about scientific research, with figures and statistics, and with scientific terms and buzzwords. Unpacking such a dense presentation of facts, quotes and figures is beyond most people, who have neither the time nor capacity to access most of the publications required to check on the plethora of claims. A classic example of bamboozling with science is the 8-page Lifesavers Guide to Fluoridation, produced by Yiamouyiannis ³², which contains 250 references from a variety of journals, court cases, books, newsletters, symposia and newspapers, as well as several personal communications. Many of these references were subsequently copied and used in anti-fluoridation publications. A two-year search for the cited literature by a team of public health experts from the Ohio Department of health revealed less than half of the cited references had no relevance to community water fluoridation (such as plant studies) and many others actually supported fluoridation but were selectively quoted and misrepresented to be in peer reviewed journals. Almost all references were found to be incompletely cited and Yiamouyiannis was found to make superficial observations, leap to unwarranted conclusions and present a pervasive bias in his evaluation of data ³³.

Moving the goalposts

As anti-fluoridation claims are disproven, the goalposts have now been moved to such an extent that satisfying calls for supporting studies is practically impossible. Chairman of the Anti-fluoridation Association of Victoria, Glen Walker, demonstrates this with his statement that "there is no evidence of a scientific study proving fluoridation is perfectly safe for humans in all public circumstances" ³⁴

Paranoia, conspiracy theories and extremism

Although many opponents of water fluoridation distance themselves from extremist views, any Internet search will reveal numerous instances of this. There is always an attraction by some to the idea that Fluoridation is part of a secret grand plot to control the population ⁵⁰ or make profit for big business. I know of no such scheme and nothing other than a desire to improve people's health has motivated this submission and I doubt the members of the STDC feel under any threat or incentive to not make their decision on the balance of good verses harm to the communities involved. However this "conspiracy theory" type is already active on the "Fluoride Free Taranaki" Facebook group where the STDC is apparently "trying to hide something" ³⁵

Well, are you??

Appendix 5

29 May 2002

**New Zealand Dental Association Inc.
Statement on Water Fluoridation ⁵¹**

1. Fluoride promotes the repair of teeth by aiding remineralisation of the surface. It works best at doing this when it is used in low concentrations, and relatively frequently. Water fluoridation is an efficient, effective and safe way to achieve this remineralisation.
2. Water fluoridation is a cost effective way of communities receiving fluoride. ESR research for NZ shows it is cost effective for communities as small as 1000 people.
3. Water fluoridation is a benefit to people of all ages with natural teeth. Among young children, decay rates are 20-60% lower than in communities without fluoridation, and in adults 15-35% lower (Newbrun 1989).
4. The safety of water fluoridation to general health has been reviewed in New Zealand, and in overseas reviews, including a recent Australian NHMRC report and a large UK review. These studies have consistently found no evidence of adverse general health effects from water fluoridation.
5. Dental fluorosis in New Zealand can appear as small white flecks or patches on the tooth surface. In 1989 a NZ study (de Liefde and Herbison) found that while it was present in some children, water fluoridation was not associated with unaesthetic front teeth. To reduce problems with fluorosis it is recommended that toothpaste be issued as a smear on the child's brush and that children don't eat toothpaste.
6. When considering the slight white flecking that can occur from fluorosis, it is also necessary to consider the pain and poor appearance caused by dental decay. The effects of decay are much more significant.
7. Fluoride is a naturally occurring element. It is found in the air, soil, water, sea water, plants and many foods. In NZ, fluoride occurs naturally in all water supplies, but at a level that is too low to protect against tooth decay. Adjusting the water fluoride level to 0.7-1.0 parts per million will provide the extra protection.

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 - (b) Also author's claim on NZ studies: <http://www.fannz.org.nz/dentalhealth.php>

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"All things are poison, and nothing is without poison; only the dose permits something not to be poisonous"

Paracelsus 1493 – 1541

