

THE FLUORIDE DEBATE

PAUL CONNETT AND KEN PERROTT

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Introduction - Ken Perrott

This is a collection of articles written by Paul Connett and Ken Perrott in their exchange of opinions on the fluoridation of drinking water and related issues. While loosely titled *The Fluoride Debate* this was in no way meant to be a debate in the gladiatorial sense. It was not about “winners” and “losers.” Our intention was to discuss the science in a format encouraging good faith discussion and intelligent participation from commenters.

I leave it to readers to decide how successful, or otherwise, we have been in this.

Introducing the authors

The authors in this 'debate' have similar academic and professional backgrounds. Both have PhDs in chemistry, worked as research chemists and are now retired. Neither of us have done original research on fluoridation specifically, although both have become involved in the public discussion of it since their retirements.

Paul Connett is an executive director of the Fluoride Action Network and campaigns throughout the world against fluoridation. He is, together with James Beck & H. Spedding Micklem, author of the book *"The Case Against Fluoride."* Paul has made several speaking tours in New Zealand as part of his campaign and will have another tour in February, 2014.

Ken Perrott is a retired research chemist. These days he writes a blog, [Open Parachute](http://openparachute.wordpress.com/) (<http://openparachute.wordpress.com/>), which deals issues related to science, human rights, philosophy and religion. Many of his articles have argued against pseudoscience and the misrepresentation of science. He has written a number of articles on scientific issues related to [fluoridation](http://openparachute.wordpress.com/fluoridation/) (see <http://openparachute.wordpress.com/fluoridation/>)

Format of debate

The exchange occurred as posts on the blog [Open Parachute](http://openparachute.wordpress.com/). Paul originally proposed it as 5 pairs of articles with Paul starting and raising specific arguments against fluoridation followed by my reponse.– Paul Connett’s specific argument first with my response second. I thought this would be a convenient size for a series of blog articles.

Paul’s first article went live on October 30, 2013. Without the discipline of an external moderator the series ended up a longer than originally planned - we ended up with 8 pairs of articles, with my final closing article posted on January 23, 2014.

Responding to requests from commenters about my own personal, rather than scientific, motivations I also posted an extra article *Why I support fluoridation* on November 11. Inevitably its content was also debated.

Editing of articles

The articles here are basically the same as originally posted in the debate. I have corrected some typos and added reference lists to my own articles recognising that the hot links provided in a blog article may not be suitable for all readers of this document. I have avoided editing or altering Paul's articles except for a few minor issues like adjusting image size..

Comment discussions

Many others, representing both sides of the "debate," participated in this exchange through the comments section of each article. Some commenters were very well informed, often with professional experience related to fluoridation. There were almost 2000 comments in total with many of them containing useful information and citations. Unfortunately it is not feasible to include the comment discussion here but I urge interested readers to browse through them on-line.

Links to debate

You can easily find original blog articles, together with comments, at the link [Fluoride Debate](http://openparachute.wordpress.com/fluoride-debate/) (<http://openparachute.wordpress.com/fluoride-debate/>)

Advice to readers

Such lengthy articles, and so many of them, might be intimidating to some readers. My advice is to browse, read the articles that interest you or cover issues of interest. I imagine only the most dedicated reader would start at the beginning and read to the end.

Any reader wishing to make contact with me can do so via my [About me](http://openparachute.wordpress.com/about-me/) blog page (<http://openparachute.wordpress.com/about-me/>).

First article: Paul Connett - October 30, 2013

This is part 1 of a five-part series of internet exchanges on the fluoridation debate between Paul Connett (USA) and Ken Perrott (NZ).

1. Fluoridation is a poor medical practice.
2. The evidence that swallowing fluoride reduces tooth decay is very weak. Better alternatives for fighting tooth decay
3. The large database that indicates that fluoride can impact the brain of animals and humans.
4. Other health concerns and the lack of an adequate margin of safety to protect everyone drinking fluoridated water.
5. Key moments since 1990 that should have forced an end to fluoridation.

Paul Connett is co-author of *The Case Against Fluoride* (Chelsea Green, 2010) and executive director of the Fluoride Action Network (www.FluorideALERT.org) Paul's cv and list of publications is attached.

Part 1. Fluoridation is a poor medical practice

Introduction. Using the public water supply to deliver medical treatment is a very unusual practice. In fact it has only been done only once before and that was a short trial in which iodine was added to the drinking water to help fight hypothyroidism. However this was quickly abandoned when it was found that some people were being over-exposed to iodine. Since then fluoridation has been the only example. The reasons for not using the water to deliver medical treatment are fairly obvious.

1) It is impossible to control the dose people get. Once a chemical is added to the water to treat people (as opposed to treating the water to make it safe or palatable to drink) it is impossible to control the dose people get. People drink very different amounts of water. In short, engineers at the water works can control the concentration added to the water (mg/liter) but no one can control the total dose (mg/day) individuals receive.

2) It is totally indiscriminate. It goes to everyone regardless of age, regardless of health or nutritional status. Of particular concern is that it goes to people with poor kidney function who are unable to clear the fluoride from their bodies via the kidneys as effectively as others. It thus accumulates in their bones more rapidly. It also goes to people with low or borderline iodine intake, which makes them more vulnerable to fluoride's impact on the thyroid gland. In general, according to studies done in India, people with poor diet (low protein, low calcium and low vitamin intake) are more vulnerable to fluoride's toxic effects.

3) It violates the individual's right to informed consent to medical treatment. This is a very important medical ethic which is fully described on the website of the American Medical Association (www.AMA.org). It is very surprising that so many medical doctors stand by while the community does to everyone what they are not allowed to do to a single patient.

The above arguments would apply to any medicine added to the drinking water but there are other aspects to the fluoride ion, which makes it particularly unsuitable for addition to the drinking water.

4) Fluoride is NOT a nutrient. There is not one single biochemical process in the body that has been shown to require fluoride for normal function (we will see later that fluoride's predominant action on teeth is topical not systemic). However,

5) There are many biochemical processes that are harmed by fluoride (given a sufficient dose). These include the inhibition of many enzymes. This is the reason that some of the earliest opponents of fluoridation were biochemists like Professor James Sumner from Cornell University, who won the Nobel Prize for his work on enzyme chemistry. More recently fluoride has been shown to activate G-proteins and interfere with the cell's messaging systems. It can also cause oxidative stress. An excellent summary of fluoride's biochemistry can be found in the article "Molecular Mechanisms of Fluoride Toxicity" by Barbier et al, 2010.

6) The levels of fluoride in mothers' milk is extremely low. This level, on average for a woman in a non-fluoridated community, is 0.004 ppm (NRC, 2006, p.40). This means that a bottle-fed baby in a fluoridated community (at 1 ppm) will get about 250 times more fluoride than a breast fed baby in a non-fluoridated community. Bearing in mind the fact that life emerged from the sea where the average level of fluoride is about 1.4 ppm, and thus there was no impediment for nature to use fluoride when developing human metabolism, her verdict appears to be that the baby a) does not need fluoride and b) that it may be harmed by fluoride. In my view, it is more likely that nature knows more about what the baby needs than a bunch of dentists from Chicago or public health officials in Washington, DC.

7) Fluoridation has always been a trade-off between lowered tooth decay and dental fluorosis but a key question was never satisfactorily answered. When the fluoridation trials began in 1945 it was known that the trade-off was that approximately 10% of the children would develop dental fluorosis in its mildest form (this was a mottling or discoloration of the tooth enamel). While the mechanism whereby fluoride caused this effect was not known it was known to be a systemic effect. In other words it was caused by fluoride interfering with biochemistry during the development of the tooth cells. The question that was not answered before the US Public Health Service endorsed fluoridation in 1950, was: "What other tissues in the body may be interfered with at the same time that fluoride was interfering with the laying down of the tooth enamel?" Were the baby's bone cells also being impacted? How about brain cells? How about the cells of the glands in the endocrine system? Sadly, very little has been done in fluoridated countries to answer these questions since

fluoridated was started. However, proponents do acknowledge that the appearance of dental fluorosis means that a child was over-exposed to fluoride before the permanent teeth have erupted. Meanwhile, in 2010 the CDC reported that 41% of American children aged 12-15 have dental fluorosis, with 8.6% having the mild form (with up to 50% of the enamel impacted) and 3.6% with moderate or severe dental fluorosis (100% of the enamel impacted). In later arguments in this debate I will be presenting evidence that fluoride is capable of harming other developing tissues.

8) The fluoridating chemicals used to fluoridate the water supply are not the pharmaceutical grade chemicals as used in dental products. Most of the chemicals used are obtained from the phosphate fertilizer industry's wet scrubbing systems (see Chapter 3, *The Case Against Fluoride*). One of the problems with this source is that it is contaminated with a number of other toxic chemicals including arsenic. Arsenic is a known human carcinogen and as such for the US Environmental Protection Agency (EPA) there is no safe level. The EPA's maximum contaminant level goal (MCLG) for drinking water is thus set at zero. Proponents will argue that after the dilution of these bulk chemicals by about 180,000 to 1, the level of arsenic is negligible. However it is not zero and thus this practice will inevitably increase cancer rates in the population. As there are other delivery systems which are cost-effective and do not involve the use of these industrial grade chemicals, increasing the cancer rate even by a small amount is not acceptable.

9) Worldwide fluoridation is not a common practice. Proponents will often imply that fluoridating the drinking water is a common practice. It is not. Most countries do not fluoridate their water. 97% of the European population is not forced to drink fluoridated water. Four European countries have salt fluoridation (Germany, France, Switzerland and Austria), but the majority of European countries have neither fluoridated water nor fluoridated salt, yet according to World Health Organization (WHO) data available online (measured as DMFT in 12-year-olds) tooth decay rates in 12-year-olds have declined as rapidly over the period 1960 to the present in non-fluoridated countries as fluoridated ones and there is little difference in tooth decay rates today (see Cheng et al, 2007). The reasons that European spokespersons have given for not fluoridating their water are usually twofold: a) they do not want to force fluoride on people who don't want it and b) there are still many unresolved health issues (see a list of statements by country at <http://fluoridealert.org/studies/caries01>).

10) Typically fluoridation is promoted via endorsements not via sound science. When the US Public Health Service (PHS) endorsed fluoridation in 1950, before a single trial had been completed and before any meaningful health studies had been published, it clearly was not the result of solid scientific research. However the PHS endorsement set off a flood of endorsements from other health agencies and professional bodies (see Chapters 9 and 10 in *The Case Against Fluoride*). Most of these came between 1950 and 1952. These endorsements were not scientific but simply reflected a subservience of public policy to the US government. However, promoters of fluoridation for over 60 years have used these endorsements very effectively with the general public as if they were coming from scientific bodies reflecting thorough and comprehensive scientific research. Very seldom is this the

case. Hopefully, in these exchanges with Ken Perrott we will both focus on what the primary science actually says and not what some “authority” has to say about the matter.

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Ken Perrott - October 30, 2013

Paul's first article appears to be a general overview and not detailed consideration of the ten points he makes. I will be similarly brief in my response to each point. Paul may wish to go deeper into specific issues in later contributions and I will respond in more detail then.

The medical argument

Paul's **first 3 arguments** rely on defining fluoridation as a medical treatment. This is a common anti-fluoridationist approach. I have no wish to argue about that definition as it is really just a matter of semantics. You could use a weak definition of "medicine" which can include practically anything in your diet the body uses and may tolerate over a wide range of intake without harm. Or a tighter definition implying a drug with some sort of marked effect in the body and requiring relatively careful control of intake. But whatever definition is used should be openly declared and applied consistently.

Opponents of fluoridation usually apply their definitions of "medicine" inconsistently and the argument becomes a classic bait and switch tactic. It uses a weak definition of "medicine" to capture fluoride and then switches to a tight definition to argue that use of fluoride requires rigid controls. This presents them with a number of problems because a weak definition of "medicine" must also include "natural" as well as "artificial" fluoride at natural levels in water a food. (A weak definition may also include many other elements – perhaps even water itself). There is no such thing as a "fluoride-free" water supply. If we exclude natural levels of fluoride (and most other elements) from our definition of "medicine" then why should we treat levels for artificially fluoridated water any differently?

Connett's point 1: Why should we not be concerned about controlling the dose of natural levels of fluoride (or many of the other elements we consume) while only be concerned about the fluoride added as a "top up?" The are no differences between the "artificial" and "natural" fluoride anions in drinking water. In reality most elements like this have a sufficiently wide range of concentrations and intakes for efficacy that it is just ridiculous to treat them like powerful drugs which need accurate dosage.

Connett's point 2: Similarly why make charges of indiscriminate intake only for artificially added F and not for natural levels of F and other elements? The small number of people, if any, who may have problems with fluoridation levels of F will also have the same problems with natural levels of F. Such people, if they real exist, will need individual responses to either natural or artificial levels of F and possibly other elements. These people will need individual responses whether their water supply is artificially fluoridated or not.

Connett's point 3: Why demand "informed consent" for situations where natural levels of fluoride have been "topped up" and not require it for natural levels of fluoride – which in some situations may actually be higher than for fluoridated water supplies.

Is fluoride a nutrient?

Connett's point 4: This also reduces to semantics – how should “nutrient” be defined? Paul restricts his definition only to elements involved in “biochemical processes” – a definition confidently excluding the role of F in bioapatites – bones and teeth. Yet bones and teeth are important to organisms – so the strengthening of bioapatites, and the reduction of their solubility, by incorporation of fluoride is important.

Perhaps we can agree that F is at least a beneficial element, even if we can't reach agreement on the use of terms like “nutrient” and “essential.”

Biochemical processes and fluoride

Connett's point 5: It is easy to cite literature references showing negative effects of fluoride but we should not ignore the conditions used. Most such studies refer to much higher concentrations than used in water fluoridation and this is also true for the review by [Barbier et al, 2010](#) Connett cites.

Let's not forget that community water fluoridation describes “topping up” fluoride concentrations to about 0.7 ppm F. Yet reviews of negative effects on biochemical process will quote studies which have used 50 ppm, 100 ppm or even greater concentration of F in drinking water. Opponents of fluoridation often seem completely oblivious of these huge differences in concentration when they present a long list of claims about the ill effects of fluoridation.

Another confusion readers often have with such reviews is the use of different units. The sensible reader must often apply a few conversion factors when checking the fluoride concentrations used in the reviewed studies. $1 \text{ mM} = 19 \text{ ppm}$ (or mg/L) for fluoride.

It is possible to find similar evidence of harmful effects of essential elements when present in high concentrations. Selenium is an example of such an essential element. This graph illustrates the situation for fluoride and is common to many elements.

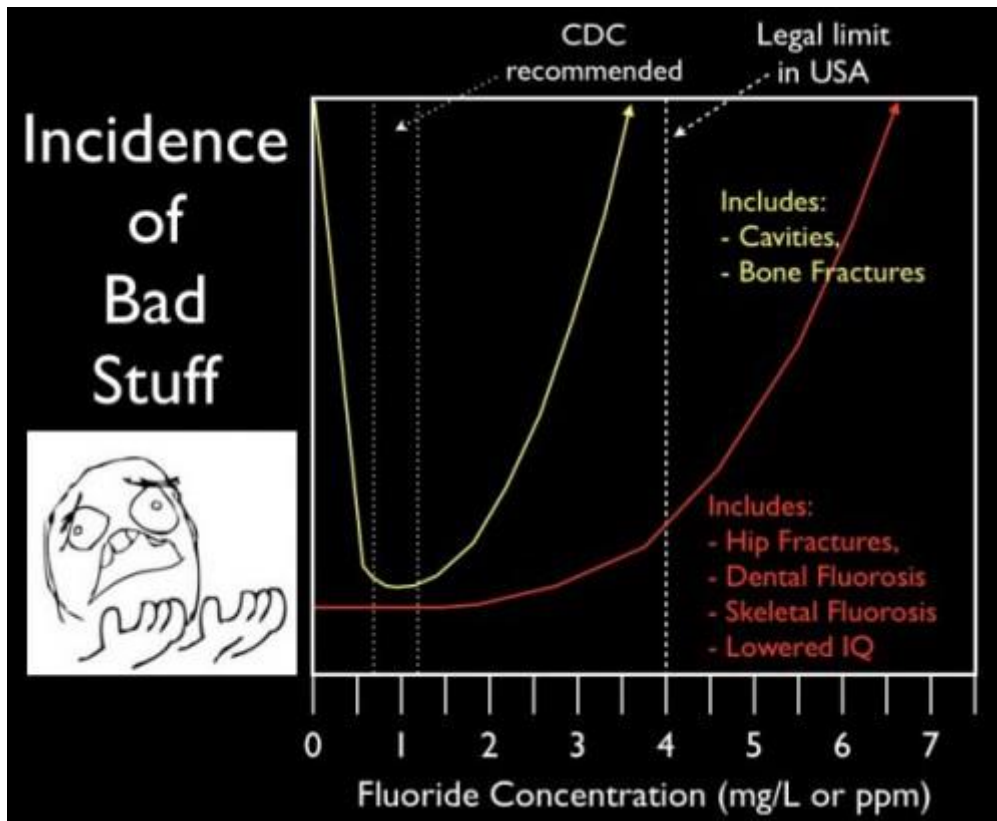


Diagram from Ethan Seigel's blog [Starts with a Bang](#) (see *Weekend Diversion: Fluoridated Water: Science, Scams and Society*).

I am not denying the usefulness of these studies of negative effects of fluoride. Researchers and policy makers should continuously assess research findings for their relevance to the fluoridation issue and guidelines used in regulations. But this assessment must be critical and intelligent – not simply a search to confirm biases.

Health authorities should not be swayed by populist naive interpretations of research.

Naturalistic fallacies

Connett's point 6: Sure, organisms evolve to fit the parameters of their environment. But to say "it is more likely that nature knows more about what the baby needs than a bunch of dentists from Chicago or public health officials in Washington, DC" is really not a good way of deciding this issue. Do we really want to argue that the situations in which marine animals evolved are the best to aim for in a society which has undergone so much cultural and intellectual evolution? Are we to reject the idea that society should task experts to consider possible approaches for our future by the argument that "nature knows best" and give up all rights for humanity to improve its condition? Do we really think that the environment that ancestral species experienced millions of years ago are necessarily the best for us today?

Modern humans live in environments offering a range of natural dietary fluoride intakes. We know that very low or very high intakes present problems for our bones and teeth. We should not avoid the problems this presents by saying “nature knows best.”

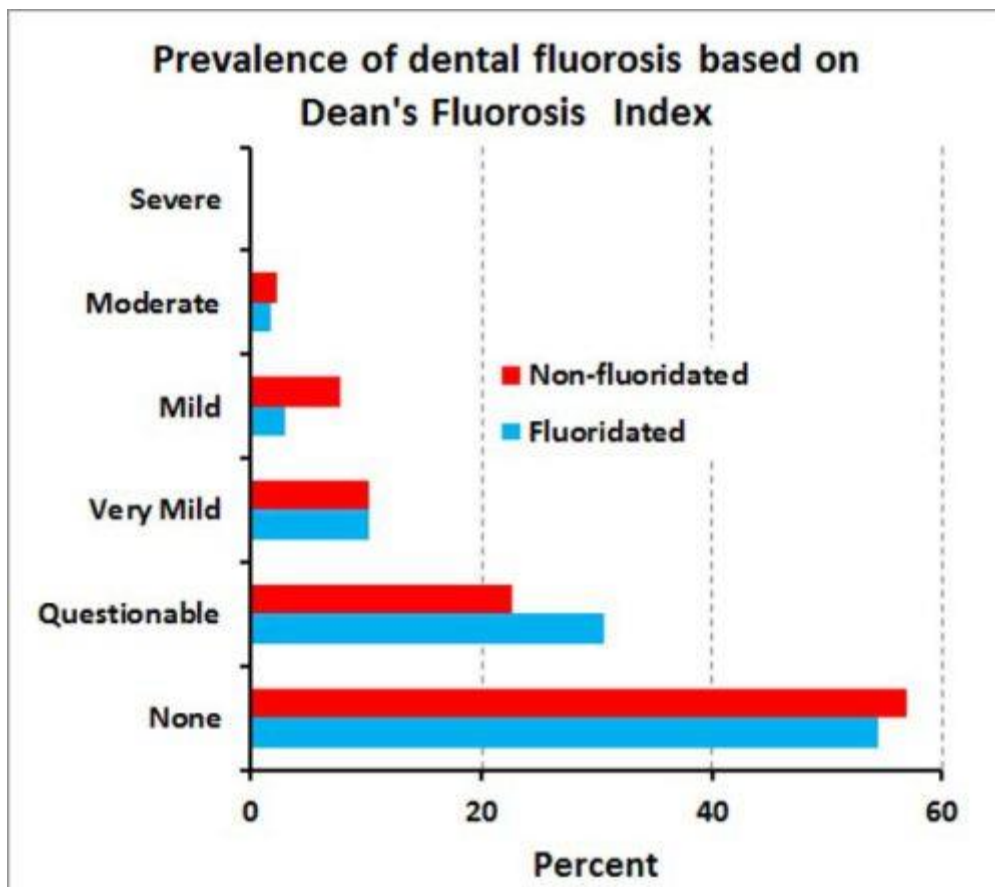
The very low levels of F in breast milk may have more to do with the inorganic role of F in animal bodies than any wisdom that “nature” has.

Fluorosis

Proponents of fluoridation do acknowledge dental fluorosis in a negative, although minor, aspect of fluoridation.

Connett’s point 7: Opponents of fluoridation will often quote high values of the incidence of fluorosis which ignore the fact that much of it is “questionable” and/or “very mild.” These grades are really only cosmetic and usually can only be detected by a professional. Opponents may also hide the fact that the incidence of fluorosis for children living in fluoridated may often be the same as, or only slightly greater than, the incidence for children living in non-fluoridated areas.

The graphs below shows the situation reported for New Zealand in the 2009 New Zealand Oral health Survey (see *Our Oral Health*).



See Wikipedia for a brief description of Dean’s Fluorosis Index.

Health experts have generally concluded that the apparent rise in the incidence of fluorosis is caused by increases in other forms of fluoride intake, such as from eating toothpaste, and not from fluoridated water.

Fluorosis could well have been a normal feature of teeth and bones for a very long time. Remember many areas of the world are high in natural forms of fluoride and the body does not seem to have a process for fine regulation of blood and plasma fluoride concentrations. Perhaps we should consider very mild and questionable levels of fluoride as cosmetically perfectly acceptable. Considering the natural variation in fluoride intakes some people might argue that “*nature knows best.*”

Nature of fluoridating chemicals

Connett’s point 8: Anti-fluoridationists make wild claims about fluoridation chemicals. “They are industrial waste products, loaded with heavy metals and fluorosilicates are toxic and/or untested for toxicity!”

Claims of contamination with toxic elements are easily, and often, made but are never justified with any evidence. So let's look at the reality.

By-products that are used are not waste products – and surely we should aim for the efficient use of natural resources. The purchaser of any product will sensibly make sure it is suitable for their requirements – and these are rigidly defined for water treatment chemicals.

Suppliers are required to provide certificates of analysis and maximum values for contaminants in chemicals used for water treatment. Those regulations are determined from the maximum concentrations of contaminants allowed in the finished water for human consumption. Safety factors are also involved as well as allowance for contribution from other sources.

The table below contains analytical data for contaminants taken from the certificate of analysis for the last batch of fluorosilicic acid used in the Hamilton, New Zealand, water treatment plant (see FSA column). I compare the data with the maximum allowed impurity levels of fluorosilicic acid defined in the regulations (Impurity limits column) and with an example of the contaminant concentrations in finished water (Drinking water column).

1. These concentrations are extremely low, meaning that the final concentrations in the finished water are insignificant.
2. For comparison, column one provides the maximum permissible concentrations allowed for fluorosilicic acid used for water treatment (*NZ Water and Wastes Association Standard for “Water Treatment Grade” fluoride, 1997.*).
3. The NSF, which regularly monitors contaminants in water treatment chemicals says in this year’s NSF Fact sheet on fluoridation:
“In summary, the majority of fluoridation products as a class, based on NSF test results, do not contribute measurable amounts of arsenic, lead, other heavy metals, radionuclides, to the drinking water.”

And the NZ Waste Water Association's report says:

“Commercially available hydrofluorosilicic acid, sodium fluoride and sodium silicofluoride are not known to contribute significant quantities of contaminants that adversely affect the potability of drinking water.”

Brown, Cornwall & McPhee, 2004 say in their review paper, *Trace contaminants in water treatment chemicals: sources and fate*:

“Coagulant chemicals are the main source of trace metal contamination in water treatment.”

4. Some people seem to think that simply quoting concentration of contaminant species is proof of contamination – irrespective of the actual magnitudes. I have seen speakers flash up a slide listing heavy metal contents without bringing notice to the actual concentrations. That is silly. Our environment, no matter how “natural,” will always contain some amount of contaminant chemicals – it is the actual amount that is important – not that it can be, or is, measured.

Toxic Element	Impurity limits*	FSA**	Drinking water**
Sb (ppm)	40	<0.09	-
As (ppm)	132	0.4	<0.002
Cd (ppm)	40	0.11	<0.001
Cr (ppm)	660	0.8	<0.001
Hg (ppm)	26	< 0.05	<0.001
Ni (ppm)	264	< 1	<0.001
Pb (ppm)	132	0.8	<0.001

* Maximum acceptable contamination.

** From Certificate of Analysis

***For Gear Island Treatment Plant, Greater Wellington region.

There are several points to make.

Arsenic in community water supplies

Paul raises the problem of arsenic and this provides an opportunity to put the contaminants in fluorosilicic acid into context. The table shows that As levels are typically very low in fluorosilicic acid used for water treatment (0.4 ppm As). In my article *“Hamilton – the water is the problem, not the fluoride!”* I show that in the local Hamilton, New Zealand, situation the source water from the Waikato River is the major source of As in the finished water – several orders of magnitude greater than for than from treatment chemicals.

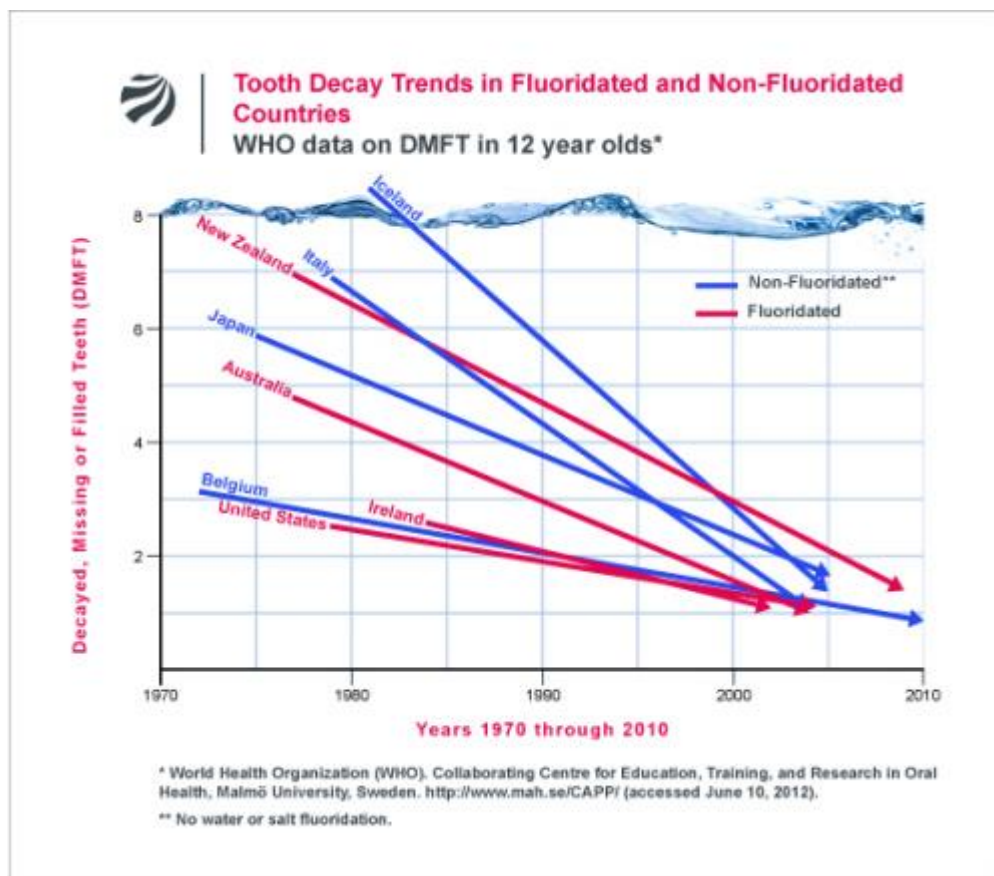
Anti-fluoridationists often rely on a recent paper by Hirzy et al. (2013) for their claims about As in fluorosilicic acid and its effect on the incidence of cancer. Hirzy has since

acknowledged errors in his calculations and described himself as embarrassed by them and his mistake about cancers. A petition to the EPA which used his data to argue against use of fluorosilicic acid in water treatment was rejected partly because of these errors (see *Anti-fluoridation study flawed – petition rejected*).

Fluoridation data around the world

Connett’s point 9: Yes, a few countries do not fluoridate their water community supplies for political reasons, but decisions against water fluoridation can depend on a range of factors including size and centrality of water treatment plants, widespread use of bottled water, naturally sufficient water fluoride concentrations, etc.

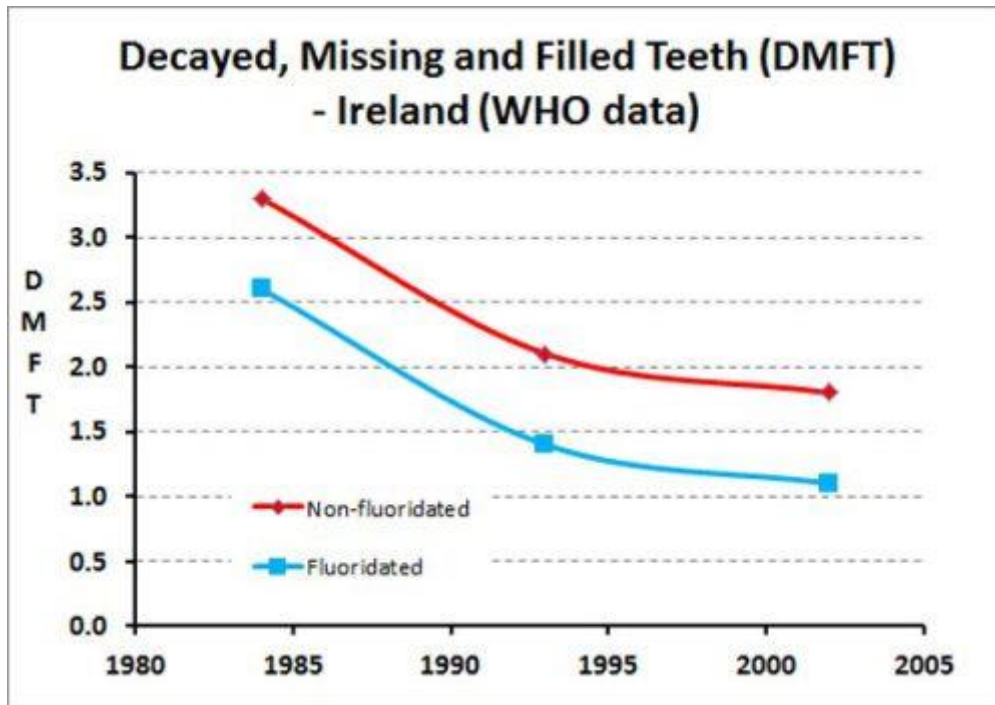
Paul refers to a plot used by Cheng et al (2007) – which is similar to this one:



This and similar plots are much beloved but anti-fluoridation propagandists. But while the plots do show improvements in oral health for countries irrespective of fluoridation they say nothing about the effect of fluoride. Simple comparison of countries obscures all sorts of effects such as differences in culture, history, social and political policies, etc. Such plots are also influenced by changes and differences in dental treatment and measurement techniques.

However, there are some within country data within the WHO data set Cheng et al used which can give a better idea of the beneficial effects of fluoridation. This plot shows the

results for the [WHO data for Ireland](#). A clear sign that fluoridation has played a beneficial role.



Political and scientific arenas.

Connett's point 10: The debates around fluoridation involve both scientific and political issues. Inevitably this leads to the separate issues being mixed. I find, for example, that attempts to discuss the ethical aspects always get diverted into differences in understanding of the science. For example the paper *Ethics of Artificial Water Fluoridation in Australia* by Niyi Awofeso is meant to be a description of the ethical issues. However, it assumes mistaken ideas about the science – that fluorosilicate species are present in fluoridated drinking water. Without the correct science it is so easy to end up with invalid ethics.

Appeal to authority is also a problem. Connett does this, for example, in his reference to Prof. James Summer, Nobel prize winner. Similarly wild claims are often made about Nobel prize winners and “top scientists” opposing community water fluoridation – these are really not valid arguments.

I feel that opponents of fluoridation commonly rely more on confirmation bias than critical and objective assessment when referring to the scientific literature.

There is also a reliance on conspiracy theories and poisoning of the well. We have seen personal attacks on scientists and health authorities in New Zealand when they have spoken up to defend the science. Childish name calling, accusations of being paid to make incorrect claims, charges of being “shills” for industry, etc. This is simply “playing the man and not the ball” and makes good faith discussion of the science impossible.

This even gets into peer-reviewed scientific literature. The authors of the paper Connett refers to, Cheng et al 2007, do this when they accused one side, that of health authorities, of “questionable objectivity.” Pots and kettles?

All of these problems are probably inevitable for an issue like this where political and ideological interests operate. But they are an anathema to proper scientific consideration.

Professor Gluckman, the NZ Prime Ministers Chief advisor on Science commented that fluoridation controversies were an example of science being a proxy for values/political issues. This leads to misrepresentation of the science, cherry picking of data, and relying on confirmation bias and google for literature searches. Ideology and values are the motivating factors but a caricature of science is used in the debate.

Good faith discussion of the scientific issue around fluoridation requires much more objectivity than is usually demonstrated by the opponents of fluoridation.

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WHO data for Ireland. See <http://www.mah.se/CAPP/Country-Oral-Health-Profiles/EURO/>

Paul Connett - November 4, 2013

Fluoride debate: Paul responds to Ken's response to part 1 of his argument against fluoridation, "Fluoridation is a poor medical practice."

Ken writes: Paul's first article appears to be a general overview and not detailed consideration of the ten points he makes. I will be similarly brief in my response to each point. Paul may wish to go deeper into specific issues in later contributions and I will respond in more detail then.

Paul responds: I certainly do, but before I do this Ken I would like to make two reasonable requests. First, please drop the term anti-fluoridationist, which I find offensive. It makes opposition to fluoridation sound like some mental disease! I am a scientist who opposes water fluoridation based upon my 17-year review of the scientific literature. So please use the more respectful and neutral term "opponent of fluoridation." Secondly, please stick to addressing my arguments without going into the opinions and arguments of others, especially the more extreme views. I am not responsible for *all* the arguments used by *all* the opponents of fluoridation, just as you are not responsible for *all* the views of *all* the proponents of fluoridation. To digress into these will simply confuse the arguments between ourselves and waste time and space.

My arguments 1,2 and 3 (You can't control dose, who gets the medicine and it violates the individual's right to informed consent).

Ken, you have problems with my referring to water fluoridation as "medical treatment" without carefully defining the term. So here is what I consider to be a commonly understood definition of medicine or medical treatment. A medicine is a substance defined by its intended purpose, in other words it is a substance used "to treat or prevent a disease."

In the case of water fluoridation the purpose of adding fluoride ions (or fluoride compounds which release fluoride ions) to the water is "to treat or prevent dental disease." That makes water fluoridation a medical treatment. Unlike all the other chemicals added to water the fluoridating chemicals are not used to treat the water but are added to treat people. For example, unlike chlorine, they are not added to make the water safe to drink but are simply using the water supply as a delivery system for human treatment— and as I have argued – this is a very clumsy delivery system for such treatment because a) you can't control the dose delivered; b) you can't control who gets the treatment and c) you are violating the individual's right to informed consent to any kind of human treatment.

You say that this discussion it is matter of semantics. It is not. In fact in it is a matter of law. In most countries if you make a claim that a substance prevents or treats disease then it's classified as a drug or medicine and it has to go through rigorous clinical testing for safety. This has never happened for fluoride. In fact the US Food and Drug Administration classifies

fluoride for ingestion as an “unapproved drug.” This means that in the U.S. fluoride intended for ingestion has never been subjected to the double blind randomized clinical trials (RCT) for either efficacy or safety that are required of all other drugs. Nor is the FDA tracking side effects from patients or doctors, despite the fact that many individuals claim to be highly sensitive to fluoride’s toxic effects. The same professional and regulatory neglect appears to have occurred in all other fluoridated countries, including New Zealand.

As far as fluoride being a “mineral” found naturally in water or food, that does not exclude it from being classified as a medicine and needing regulation. For example Sulfites occur naturally in foods and even in tap water but the FDA controls how this ‘natural’ inorganic compound is used in the food industry because it produces asthma in 5% of the population (<http://edis.ifas.ufl.edu/fy731> and <http://www.itmonline.org/arts/sulfa.htm>).

Ken, as far as lack of control of dosage is concerned you say that it does not matter because “most elements like this have a sufficiently wide range of concentrations and intakes for efficacy that it is just ridiculous to treat them like powerful drugs which need accurate dosage.”

It is interesting that you focus on efficacy here and not on fluoride’s harmful effects. In fact, there is very little *margin of safety* between the dose (poorly defined as it is) that supposedly reduces tooth decay and the doses that have been documented to cause harm – both in the short term and over a lifetime of exposure. This point is often obscured by proponents because they prefer to discuss the matter in terms of concentration (mg/liter) rather than dose (mg/day). The former can be controlled the latter cannot.

People drink very different quantities of water. High water consumers can easily exceed the doses that have been documented to cause harm in human studies.

Let’s take a specific example to make this point clear. Xiang et al (2003a,b) found that the threshold level that reduced IQ in his study of Chinese children was 1.9 parts per million (ppm) or mg/liter. Let’s do a rough calculation of dose.

If these children were drinking two liters of water a day their dose was 3.8 mg/day (2 liters x 1.9 mg/liter); if they were drinking one liter per day their dose was 1.9 mg/day and if they were drinking half a liter of water per day their dose was 0.95 mg/day. Let’s round this off and say that the range in doses for these children was between 1 and 4 mg/day.

A child drinking water at 1 ppm would exceed these doses drinking from one to four liters per day. So some children in fluoridated communities will exceed these harmful doses, especially when you remember the other sources of fluoride that they are getting. There can be no doubt that these other sources can be quite large because as you yourself have admitted, these other sources probably explain why dental fluorosis rates in the US are four times higher than expected (41% versus 10%, CDC, 2010).

So there is no margin of safety here – even if we restrict ourselves to a consideration of just the range of doses expected in a large population. But as anyone who has studied toxicology knows we can’t stop there.

When we are extrapolating from the lowest observable dose causing harm in a small study group *to define a safe dose for a large population* we have to introduce a safety factor to take into account the wide variation in response to any toxic substance in the whole population. This factor is referred to as the intra-species variation safety factor. Its default value is 10. In other words if we were a regulatory agency doing its job we would have to divide the range of doses that caused harm (in this case 1-4 mg/day) by 10 to get a dose that we can confidently state is safe for the whole population. Thus we would not any child in the population to get a dose higher than 0.1 mg/day –and certainly not higher than 0.4 mg/day – in other words we would not want them drinking more than one large glass of water per day – to make sure that no child is exceeding a dose that could cause a lowering of IQ! Remember our task in public health is not just to protect the average child. We have to worry about the most vulnerable child.

I would also remind you that when the US National Research Council reviewed the toxicology of fluoride in water they concluded that several subsets of the US population were exceeding the US EPA's safe reference dose for fluoride (the so-called ISIS value) of 0.06 mg/kg/day. This included high water consumers and bottle fed infants. See Figure 2.8 in their report (NRC, 2006).

Ken the way you deal with the other clumsy aspects of using the water supply to deliver medical treatment is that you argue that there is no difference between “naturally” fluoridated water and “artificially” fluoridated water and because of this lack of difference you argue that we shouldn't worry about a) the fact that artificially fluoridated water is going indiscriminately to *everyone* and b) we shouldn't worry that it violates the individual's right to informed consent to medication.

First of all. There are some key differences between naturally fluoridated water and artificially fluoridated water. Usually when fluoride occurs naturally in the water it is accompanied by large concentrations of ions like calcium. The presence of the calcium can reduce the uptake of fluoride in the stomach and GI tract. No such protection is offered when the fluoridating chemicals are added to soft water.

Second, the *average* level of fluoride in most water supplies is about 0.1 ppm. This is about an order of magnitude lower than 0.7 to 1.2 ppm used in artificial fluoridation. That is not a small difference.

However, you raise an interesting point with this argument – what should we be doing about natural levels of fluoride in our water supplies?

It is clear that naturally occurring fluoride has caused a lot of health problems. Not only are millions of people being impacted by naturally occurring fluoride in areas which are endemic for both dental and skeletal fluorosis in India and China but more recent studies have shown that more subtle harm is occurring in their soft tissues as well, including lowered thyroid function, reproductive problems and lowered IQ. So I am not saying that naturally occurring fluoridated water is OK. The latter – depending on the level – may well be bad.

What I am arguing is that it is not wise to expose the whole population to deliberately elevated levels of fluoride in the water supply and we should not be forcing these increased levels on people who don't want it increased, especially when there are more rational and acceptable delivery systems (which I will discuss later).

Ken I do not find your argument for ignoring the violation of the individual's right to informed consent to this deliberate medical treatment convincing. You write: "Why demand 'informed consent' for situations where natural levels of fluoride have been 'topped up' and not require it for natural levels of fluoride – which in some situations may actually be higher than for fluoridated water supplies."

If water is "treated" in order to "treat" people, then the people "treated" should be asked to give their informed consent to that "treatment." If the water is "untreated" then there is no need to ask for their informed consent. However, in areas with fluoride levels above 0.1 ppm I believe that people should be warned about the potential harm that those natural levels may cause. Such warnings should be given especially to parents who bottle-feed their babies.

Just because fluoride occurs naturally does not make fluoride safe, just as naturally occurring arsenic is not safe. Looking to the future, as more and more scientists accept that modest levels of fluoride can cause harm, we might find ourselves being forced to lower the level of naturally occurring fluoride in water that is considered safe.

Currently, most of the world, including the World Health Organization has set a safe drinking water standard of 1.5 ppm. The US is the odd one out with a ridiculously high safety standard of 4 ppm. This was set in 1986, and according to whistle-blower at the US EPA, was set this high because of political pressures. In 2006, a US National Research Council panel concluded that this standard was not protective of health and recommended that the EPA perform a new health risk assessment to determine a safer drinking water standard (NRC, 2006). After 7 years this agency has still has not done this.

When regulatory agencies finally get to revisit the safe drinking water standard in the US and other countries – and do it free of political pressures from those who promote water fluoridation – we might find ourselves in a similar predicament that authorities have found with arsenic.

Because arsenic is a known human carcinogen the EPA has set the maximum contaminant level goal (MCLG) for arsenic at zero. This is the "ideal" level to protect the whole population from increased cancer risk. However, it is not a federally enforceable "standard," instead, as the name (MCLG) implies, it is the ideal "goal." The actual standard, or maximum contaminant level (MCL) is set at 10 ppb (10 parts per billion or 0.01 ppm). This is a compromise between the ideal and the costs to communities for getting close to this ideal goal. It would be prohibitively expensive to remove the arsenic down to zero.

With fluoride we might find ourselves in a similar situation. We might find that the background levels of exposure to fluoride from dental products, pesticides and the diet already exceeds the safe reference dose to protect against developmental harm. Thus the

MCLG for fluoride in water would have to be set at zero. However, like arsenic the costs of doing this would be prohibitive and a compromise would have to be sought. Such a compromise might yield an MCL at around 0.1 ppm (note this is still 25 times higher than the level in mothers milk). Ironically, US water engineers were recommending an MCL of 0.1 ppm in 1939, because of concerns about dental fluorosis! But removing fluoride to this level would be very expensive for some communities and political forces might push for a higher value. However, regardless of the final MCL value, if the MCLG was set at zero, it would be very clear that society could no longer tolerate the deliberate *addition* of fluoride to the water supply supposedly to fight tooth decay.

In my opening statement I singled out three subsets of the population that shouldn't be getting fluoridated water: bottle-fed babies, people with poor kidney function and people with outright or borderline iodine deficiency. Ken chose not to comment on the latter two groups. In my view we should be concerned about both groups whether they are drinking naturally occurring fluoride or artificially fluoridated water.

I believe that my first three arguments stand. Fluoridating the whole public water supply is a clumsy and reckless because you can neither control the dose nor who gets the treatment and it is unethical way of delivering human treatment because you have denied the right of the individual to informed consent.

Since most dental researchers and even promoters of fluoridation like the Oral Health Division of the Centers for Disease Control and Prevention (CDC, 1999, 2001) concede that the predominant benefit as far as protecting the teeth is concerned, is topical (rather than systemic) i.e. fluoride works on the surface of the tooth enamel and not from inside the body. A more rational way of delivering this treatment would be to brush fluoridated toothpaste directly onto the teeth. This way you would minimize exposure to other tissues and not force it on people who don't want it.

Argument 4. Is fluoride a nutrient?

Ken writes:

Connett's point 4: This also reduces to semantics – how should “nutrient” be defined? Paul restricts his definition only to elements involved in “biochemical processes” – a definition confidently excluding the role of F in bioapatites – bones and teeth. Yet bones and teeth are important to organisms – so the strengthening of bioapatites, and the reduction of their solubility, by incorporation of fluoride is important.

What Ken has glossed over here is the fact that humans can have perfectly healthy teeth and bones without fluoride. Moreover, he does not acknowledge that at the same level that fluoride interacts with bioapatites it damages those bioapatites. It is highly questionable whether the hardening effect on bones warrants interference with the bone's structure or the surrounding cells. This is what Dr. Hardy Limeback, one of the panel members of the NRC (2006) wrote about fluoride and bone:

Bone can ACCUMULATE up to 2500 ppm fluoride with fluoridation (we showed that in our Toronto vs Montreal study). The osteoclast cells are exposed to these huge concentrations (because they dissolve bone keeping the dissolved mineral under their dorsal surface through the use of hemidesmosome attachments and then they release that dissolved mineral into the bone extracellular fluid where nearby osteoblasts can also be exposed). In fact one of the theories why there is apoptosis of osteoclasts is the poisonous conditions they have to endure remodeling bone. It is also the reason there is a biologically-supported rationale for the bone cancer inducing effects of fluoride (personal correspondence, Nov 1, 2013).

As far as fighting tooth decay is concerned the most significant involvement of fluoride is the interaction with the surface of the enamel. You do not have to swallow the fluoride to have this interaction. In fact, even promoters of fluoridation now concede that it is this topical action, which is the predominant action of fluoride (CDC, 1999, 2001). Here the fluoride ion is interacting with a mineral. Such an interaction doesn't warrant the title of a "nutrient" and certainly not an essential nutrient.

Ken suggests that, "Perhaps we can agree that F is at least a beneficial element, even if we can't reach agreement on the use of terms like 'nutrient' and 'essential.'"

Maybe Ken but you are now a long way from justifying the addition of this substance to the drinking water. I would argue that if used topically fluoride is a "beneficial element (substance)" in the same way that sun tan lotion is a "beneficial substance" when applied to the skin to protect us from damaging ultraviolet light or antiseptics are "beneficial substances" when added to soap to kill bacteria. But this does not make these substances nutrients and no one in their right mind would want to swallow them. Nor should they want to deliberately swallow fluoride.

5. Biochemical processes and fluoride

Ken writes,

"Connett's point 5: It is easy to cite literature references showing negative effects of fluoride but we should not ignore the conditions used. Most such studies refer to much higher concentrations than used in water fluoridation and this is also true for the review by Barbier et al, 2010 Connett cites.

Let's not forget that community water fluoridation describes "topping up" fluoride concentrations to about 0.7 ppm F. Yet reviews of negative effects on biochemical process will quote studies which have used 50 ppm, 100 ppm or even greater concentration of F in drinking water. Opponents of fluoridation often seem completely oblivious of these huge differences in concentration when they present a long list of claims about the ill effects of fluoridation."

First of all in biochemistry and toxicology it is not at all unusual – especially in animal experiments – to use high concentrations to probe toxic effects. The alternative of using lower concentrations is you are forced to use a very large number of animals in order to tease

out an effect. This is very expensive. Furthermore, in the case of fluoride it is well known that you have to give 5 to 10 times as much fluoride to rats to reach the same plasma level as you need in humans.

I should add that there have been some animal studies where the level of fluoride used that has caused harm is very low indeed. This is particularly true in chronic studies. For example, Varner et al, 1998 fed rats 1 ppm in water for one year and found kidney damage, visible brain damage, a greater uptake of aluminium into the brain, and beta-amyloid deposits which have been associated with Alzheimer's disease.

As far as human studies are concerned Ken should know it is not the *highest* doses that cause harm which is of concern, but the *lowest* doses. For example, in the meta-analysis of 27 IQ studies carried out by the team from Harvard University (Choi et al., 2012), 26 of the studies found a lowered IQ in high fluoride villages compared to low fluoride villages (an average lowering of 7 IQ points). It is true that the range of the fluoride levels went as high as 11.5 ppm. However, the relevant fact is that in eight of the studies the high fluoride village had less than 3 ppm of fluoride in the well water. That leaves no adequate margin of safety to protect all our children drinking water at 0.7 ppm and getting fluoride from other sources. See also the discussion of Xiang et al (2003a,b) above where he found a threshold of 1.9 ppm.

Ken adds, “Another confusion readers often have with such reviews is the use of different units. The sensible reader must often apply a few conversion factors when checking the fluoride concentrations used in the reviewed studies. 1 mM = 19 ppm (or mg/L) for fluoride.”

Others may be confused by this but I am not and I do not understand why Ken brought this issue up.

Ken also adds, “Health authorities should not be swayed by populist naive interpretations of research.”

If Ken is directing that comment to me (or to the contents of the book I co-authored with two other scientists, *The Case Against Fluoride*), I find his comment insulting, especially to my co-authors who are meticulous in such matters. If he is directing it towards others, I see no reason for bringing it up in this exchange.

6. Naturalistic fallacies

Ken writes:

“Connett’s point 6: Sure, organisms evolve to fit the parameters of their environment. But to say “*it is more likely that nature knows more about what the baby needs than a bunch of dentists from Chicago or public health officials in Washington, DC*” is really not a good way of deciding this issue. Do we really want to argue that the situations in which marine animals evolved are the best to aim for in a society which has undergone so much cultural and intellectual evolution? Are we to reject the idea that society should task experts to consider possible approaches for our future by the argument that “*nature knows best*” and give up all

rights for humanity to improve its condition? Do we really think that the environment that ancestral species experienced millions of years ago are necessarily the best for us today?

Modern humans live in environments offering a range of natural dietary fluoride intakes. We know that very low or very high intakes present problems for our bones and teeth. We should not avoid the problems this presents by saying “*nature knows best.*”

The very low levels of F in breast milk may have more to do with the inorganic role of F in animal bodies than any wisdom that “nature” has.

I think Ken has not appreciated the thrust of my argument here. So let me attempt to restate the case.

In your response Ken you have attempted to downplay any significance in the fact that the level of fluoride in mothers’ milk is naturally so low (0.004 ppm, NRC, 2006, p.40). I am surprised that you feel this way. Let me explain.

What levels of fluoride that end up “naturally” in our ground or surface water is a vagary of geology over which “nature” (or biological evolution) has little control. However, biological evolution has had control over how much fluoride it has inserted into normal biological functions. In the earliest days of evolution there was plenty of fluoride available in the sea (average 1.4 ppm) for nature to use in the biology of aquatic creatures but it did not do so. Yes the fluoride may well have been sequestered in the shells or bones of these creatures and made shark’s teeth stronger, but no use was found in either the structure or function of enzymes, proteins, membranes, fats, nucleic acids or any of the other components of active biochemistry. Nor have the fluoride ions –unlike many other ions (e.g. potassium sodium calcium or chloride ions) been used in messaging systems. By the time we reach the mammal we still find no use made of this ion in biochemistry.

So, when we look at the baby’s first meal and we find very little fluoride there (0.004 ppm, NRC, 2006, p.40), it appears entirely consistent with the notion that the baby does not need fluoride for healthy development.

Moreover, this very low level in mothers’ milk *might* mean that nature deliberately kept the fluoride away from the mammalian baby’s delicate tissues during early development, which again is consistent with the known toxicity of fluoride. The fluoride ion is incompatible with many biological functions.

Is it not reckless then to knowingly expose the bottle-fed baby to 175-300 times more fluoride than the breast-fed baby? Especially, when we know that fluoride can harm at least one developing tissue (the growing tooth cells) at very low levels and cause the condition known as dental fluorosis.

It is particularly disturbing that very few studies probing the possibility of subtle effects of fluoride on other developing tissues in the baby before this practice was launched in 1945, or endorsed by the US Public Health Service in 1950.

Even when some warning signals emerged during the early trials they were cavalierly ignored by those hell-bent on promoting this practice. For example, when Schlesinger et al., published the results of the Newburgh-Kingston trial in 1956 they reported that young girls in the fluoridated community were menstruating 5 months earlier on average than the girls in the non-fluoridated community, and that the young boys were experiencing about twice as many cortical bone defects in the fluoridated community compared with the non-fluoridated community. However, no follow-up studies were recommended (see Chapters 9 and 10, *The Case Against Fluoride*). These red flags were ignored then just as the studies indicating a lowering of IQ associated with fairly modest levels of fluoride exposure, are being ignored or downplayed by proponents today.

7. Fluorosis

Ken argues that, “Proponents of fluoridation do acknowledge dental fluorosis is a negative, although minor, aspect of fluoridation.”

Paul’ response: Ken you may consider dental fluorosis to be a minor consideration, but that does not apply to all those children – especially teenagers – who are afflicted with this condition. Even mild fluorosis can be psychologically damaging.

Ken adds:

“ Opponents of fluoridation will often quote high values of the incidence of fluorosis which ignore the fact that much of it is “questionable” and/or “very mild.” These grades are really only cosmetic and usually can only be detected by a professional. Opponents may also hide the fact that the incidence of fluorosis for children living in fluoridated may often be the same as, or only slightly greater than, the incidence for children living in non-fluoridated areas.”

Paul’s response: What the CDC reported in 2010, was that 41% of American children aged 12-15 had some form of dental fluorosis over and above the questionable category. Of this 41%:

28.5% were in the very mild category, which according to Dean ranged from small white patches on the cusp of the tooth up to 25% of the enamel (of the affected teeth) impacted.

8.6% were in the mild category where between 26 and 50% of the enamel (of the affected teeth) is impacted. In testimony before Congress Dean testified that he did not believe that any mild dental fluorosis was an acceptable trade-off for lowered tooth decay.

3.6% were in the moderate or severe category where 100% of the enamel (of the affected teeth) is impacted.

Thus 12.2% of these cases are thus in the unacceptable categories. Moreover, these numbers are an average of children living in both fluoridated and non-fluoridated areas and thus it is reasonable to anticipate that the numbers in the fluoridated areas are significantly higher. In a review of the data collected in 1986-87 by the National Institute of Dental Research, Heller et al (1997) reported:

13.5% dental fluorosis prevalence in communities less than **0.3 ppm** fluoride in their water

21.7 % dental fluorosis prevalence in communities with **0.3 – <0.7ppm** fluoride in their water

29.9% dental fluorosis prevalence in communities with **0.7 – 1.2 ppm** fluoride in their water

41.4% dental fluorosis prevalence in communities with **>1.2 ppm** fluoride in their water.

Thus as far as the US figures are concerned it is not true that the dental fluorosis rates in non-fluoridated areas are the same or very close to the rates in fluoridated areas as Ken states. It is clear that the level of fluoride in the water remains a key factor. It is also the factor, which is most amenable to mitigation by a public policy change, i.e. lowering the level of fluoride added or ending water fluoridation altogether.

8. Nature of fluoridating chemicals

In this section Ken goes way beyond my stated concerns. I stated that the chemicals used are not pharmaceutical grade. That they are waste products from the phosphate fertilizer industry and that they contain arsenic, which is a known human carcinogen and thus will UNNECESSARILY increase cancer rates in fluoridated communities.

Ken writes:

Connett's point 8: Anti-fluoridationists make wild claims about fluoridation chemicals. "They are industrial waste products, loaded with heavy metals and fluorosilicates are toxic and/or untested for toxicity!"

Claims of contamination with toxic elements are easily, and often, made but are never justified with any evidence. So let's look at the reality.

By-products that are used are not waste products – and surely we should aim for the efficient use of natural resources. The purchaser of any product will sensibly make sure it is suitable for their requirements – and these are rigidly defined for water treatment chemicals.

Suppliers are required to provide certificates of analysis and maximum values for contaminants in chemicals used for water treatment. Those regulations are determined from the maximum concentrations of contaminants allowed in the finished water for human consumption. Safety factors are also involved as well as allowance for contribution from other sources.

The table below contains analytical data for contaminants taken from certificate of analysis for the last batch of fluorosilicic acid used in the Hamilton, New Zealand, water treatment plant (see FSA column)...

Paul's response. I will jump over Ken's table here and focus on responding to the contaminant over which I expressed my concern: arsenic.

Ken writes: Arsenic in community water supplies

Paul raises the problem of arsenic and this provides an opportunity to put the contaminants in fluorosilicic acid into context. The table shows that As levels are typically very low in fluorosilicic acid used for water treatment (0.4 ppm As). In my article "*Hamilton – the water is the problem, not the fluoride!*" I show that in the local Hamilton, New Zealand, situation the source water from the Waikato River is the major source of As in the finished water – several orders of magnitude greater than for than from treatment chemicals.

Anti-fluoridationists often rely on a recent paper by Hirzy et al. (2013) for their claims about As in fluorosilicic acid and its effect on the incidence of cancer. Zany (sic) has since acknowledged errors in his calculations and described himself as embarrassed by them and his mistake about cancers. A petition to the EPA which used his data to argue against use of fluorosilicic acid in water treatment was rejected partly because of these errors (see *Anti-fluoridation study flawed – petition rejected*).

Paul's response: As Ken has singled out a close colleague of mine –Dr. J. William Hirzy, a former senior scientist at the US EPA – I have asked him to respond to his comments. I should add that to his credit Dr. Hirzy was very quick to admit his mistake and apologize for it. However, it is not to the credit to the promoters of fluoridation to use this single mistake to throw out the rest of his important analysis and argument.

Dr. Hirzy writes:

November 1, 2013

Regarding arsenic contamination of fluorosilicic acid (FSA).

Perrott's citation of "a certificate of analysis" (emphasis added) showing 0.4 ppm arsenic is not evidence of routine low levels of that contaminant in FSA. Based on 19 certificates of analysis from acid suppliers Cargill and Mosaic (including two reporting only "complies with NSF Std. 60"), 11 laboratory analyses from the Denver, Colorado water authority and 3 analyses from the City of Escondido California, the mean arsenic level in these 33 samples was 41.4 ppm. Upper and lower 95% confidence limits were 123 and 15.8 ppm, respectively. These values derived from assuming the two "complies with NSF Std 60" samples contained arsenic at ½ the Std. 60 allowable level of 380 ppm, namely 190 ppm. Without those two "Std. 60" samples, the mean and 95% upper and lower confidence limit values were 31.9, 62.3 and 15.5 ppm, respectively.

With respect to Perrott's comments about the error in my paper comparing use of pharmaceutical grade sodium fluoride (U.S.P. NaF) and "by-product" fluorosilicic acid, my finding of the difference in lung and bladder cancer risks between the two agents was not challenged by the U.S. Environmental Protection Agency (USEPA).

Fluorosilicic acid with 30 ppm arsenic poses 100 fold higher risk for these cancer types than does U.S.P. NaF, whether one considers lifetime exposures or only annual exposures.

Perrott's claim that contaminant levels are rigidly defined and safety factors offer additional protection is hollow. Arsenic levels in water permitted under the "safety factor" provided by NSF Std. 60 actually allows for 1200 fold higher cancer rates than use of U.S.P. NaF would cause – another finding in my paper not challenged by USEPA.

Furthermore the City of Wellington, Florida proudly announced in its Annual Drinking Water Quality Report for 2009 "...that arsenic is added to the drinking water (approximately 1.1 micrograms per liter) as part of the fluoridation process...", which is well over the NSF Std. 60 permissible level. Who is minding the store? Of what real value is that standard?

For Perrott to claim, regarding the permitted arsenic levels that, "These concentrations are extremely low, meaning that the final concentrations in the finished water are insignificant..." ignores basic toxicology insofar as low levels of chronic exposure to arsenic have been shown in my paper – and not challenged by USEPA – to result in 100 to 1200 fold higher cancer rates than would be caused by use of U.S.P. NaF. Likewise, NSF's assertion quoted by Perrott, viz. "...In summary, the majority of fluoridation products as a class, based on NSF test results, do not contribute measurable amounts of arsenic, lead, other heavy metals, radionuclides, to the drinking water..." is also a meaningless attempt at reassuring the public that upon dilution, FSA's contaminant levels can cause no harm. In USEPA's response to the referenced petition the Agency notes that measurable levels of arsenic were detected in fluoridated water during monitoring from 2007 to 2011, with mean and maximum levels being 0.15 ppb and 0.6 ppb as reported by NSF. So much for NSF's public relations declaration of "no measurable amounts of arsenic...in drinking water." At 0.15 ppb arsenic, the difference in cancer rates between FSA and U.S.P. NaF is actually more than 200 fold – twice as high as the levels shown in my paper.

Perrott's citation of a similar public relations declaration by the New Zealand Waste Water Association is likewise without merit.

Recent calculations on the cohorts of people in the United States who have been exposed to 0.15 ppb arsenic since 1965, 1967, 1975, 1989, and 1992, using USEPA's risk and cost data (which were used in my referenced paper and not challenged by that agency in its response to the referenced petition) show that by 2020, there is an expected increase of 2000 lung/bladder cancers in these cohorts attributable to arsenic in drinking water, costing \$7 billion in 2001 dollars.

If Perrott's claim that using the phosphate industry's waste acid for ingestion in fluoridated water is merely an "efficient use of natural resources" is valid, then why not use neutralized FSA in fluoridated tooth paste and mouth wash?

The "efficient use of natural resources," viz. FSA in the U.S. is reflected in sale of about 280,000 tons of 23% assay FSA in 2011¹, which at an average price of \$2000/ton,² resulted in transfer of taxpayers' cash of over \$500,000,000 to phosphate producers in 2011 alone. And over 99 percent of that purchased phosphate waste was, and is now, flushed down toilets, shower drains, and the like.

Water fluoridation, especially with FSA in the U.S., is not at all about improving dental health; it is rather about U.S. taxpayers paying phosphate producers billions of dollars for the privilege of having our public drinking water systems used to dispose of an acid that would otherwise have to be managed in a hazardous waste facility, and thereby improving the bottom lines of phosphate producers.

J. William Hirzy, Ph.D.

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2. <http://www.scribd.com/doc/18235930/NYC-Fluoridation-Costs-2008-Feb-2-2009-Letter-Page-1> accessed 11/01/2013

9. Fluoridation data around the world

Ken writes:

“Connett’s point 9: Yes, a few countries do not fluoridate their water community supplies for political reasons, but decisions against water fluoridation can depend on a range of factors including size and centrality of water treatment plants, widespread use of bottled water, naturally sufficient water fluoride concentrations, etc.”

Paul’s response:

It is not just a few countries but the vast majority of countries that do not fluoridate their water. About 30 countries have some cities fluoridated, but only 10 have more than 50% of their populations drinking artificially fluoridated water.

Your explanations for why the vast majority of countries do not fluoridate reads more like self-serving political spin than the reality. On our website we have offered explanations from spokespersons from many of the countries that have stopped or never started to fluoridate their water (see *50 Reasons to Oppose Fluoridation*). There are two main reasons given: a) they do not want to force fluoridated water on people who don’t want it and b) they are not satisfied that all the health concerns have been addressed. From what I can see none of them give the explanations that you have offered. Perhaps you can provide statements from some of the non-fluoridated countries that support the claims you have made in their name.

In response to the plots of tooth decay versus time as presented by Paul by Cheng et al (2007), Ken writes:

“while the plots do show improvements in oral health for countries irrespective of fluoridation they say nothing about the effect of fluoride. Simple comparison of countries obscures all sorts of effects such as differences in culture, history, social and political

policies, etc. Such plots are also influenced by changes and differences in dental treatment and measurement techniques.”

Paul’s response:

Certainly many factors influence tooth decay. There is bound to be a lot of noise in a large data-set. However, what is striking to me – and others – is that the presence of fluoride in the drinking water does not appear to rise above this noise. On the face of it the relationship between fluoridation and tooth decay appears to be weak at best. Especially compared to two other relationships, which are very strong: the relationship between fluoride levels in water and dental fluorosis and the relationship between tooth decay and income levels.

Ken writes:

However, there are some within country data within the WHO data set Cheng et al used which can give a better idea of the beneficial effects of fluoridation. This plot shows the results for the WHO data for Ireland. A clear sign that fluoridation has played a beneficial role.

Paul responds:

Since being invited by the Irish government to testify before its Fluoridation Forum panel in 2000, I have not been impressed with the objectivity on this issue by the pro-fluoridation dental researchers there. Thus I would not exclude the researchers’ bias influencing this result.

Ireland has had mandatory fluoridation since 1963. If this comparison between the Republic of Ireland and Northern Ireland was legitimate it would have been more impressive and more appropriate to have compared the health status of the two populations. Like many fluoridated countries (including Australia, Canada, New Zealand) very few health studies (if any) have been conducted in Ireland comparing the health of fluoridated and non-fluoridated communities. Particularly absent are studies that have used the severity of dental fluorosis as a biomarker of exposure to investigate various health and development problems in children, such as bone defects and fractures, onset of puberty, thyroid function and lowered IQ.

10. Political and scientific arenas.

Ken wrote the following in response to my comment about the way that many proponents of fluoridation use endorsements of fluoridation by government agencies and professional bodies to win their case for fluoridation with the general public instead of using the primary scientific literature. I am glad that Ken has not done that in his responses.

Ken adds:

The debates around fluoridation involve both scientific and political issues. Inevitably this leads to the separate issues being mixed. I find, for example, that attempts to discuss the ethical aspects always get diverted into differences in understanding of the science. For

example the paper *Ethics of Artificial Water Fluoridation in Australia* by Niyi Awofeso is meant to be a description of the ethical issues. However, it assumes mistaken ideas about the science – that fluorosilicate species are present in fluoridated drinking water. Without the correct science it is so easy to end up with invalid ethics.

My response: This comment does not respond to my concerns here. I will leave Professor Awofeso to respond.

Ken writes: “Appeal to authority is also a problem. Connett does this, for example, in his reference to Prof. James Sumner, Nobel prize winner.”

Paul responds: I think this is a very weak argument. I simply pointed out that some of the earliest opponents of fluoridation were biochemists who had used fluoride to poison enzymes in their experiments. James Sumner was a distinguished example. Citing the fact that he won a Noble prize for his work on enzyme chemistry simply underlines the fact that he knew something about the subject.

Ken writes:

I feel that opponents of fluoridation commonly rely more on confirmation bias than critical and objective assessment when referring to the scientific literature.

There is also a reliance on conspiracy theories and poisoning of the well. We have seen personal attacks on scientists and health authorities in New Zealand when they have spoken up to defend the science. Childish name calling, accusations of being paid to make incorrect claims, charges of being “shills” for industry, etc. This is simply “playing the man and not the ball” and makes good faith discussion of the science impossible.

Paul responds: If Ken is referring to me here then let him give specific examples to which I can respond. If he is referring to others I think they are out of place in this exchange with me.

We made a point in our book, and also in public presentations, to disavow the more nutty conspiracy theories espoused by some opponents of fluoridation. We do not believe that the evidence that Hitler used fluoride in the concentration camps sufficient to convince a historian. Meanwhile, in our view it is offensive to the many well-intentioned dentists and others who promote fluoridation to be associated with such a horrendous person. Nor do we believe that fluoridation is an attempt to dumb down or limit the world’s population. However, promoters of fluoridation should not be surprised that some people are trying to come up with a *rational* explanation for why certain governments are behaving so *irrationally* promoting this practice. They continue to do so long after the science has shown that swallowing fluoride does not reduce tooth decay, that there are many risks involved and that there are clearly alternative ways of fighting tooth decay, which have been demonstrated in the vast majority of countries, which do not choose to force their populations to drink artificially fluoridated water.

Ken writes: This even gets into peer-reviewed scientific literature. The authors of the paper Connett refers to, Cheng et al 2007, do this when they accused one side, that of health authorities, of “questionable objectivity.” Pots and kettles?

Paul responds: Hardly. Cheng et al 2007 actually question the objectivity of *both* sides in this debate. However, sadly, they were not out of place questioning the objectivity of spokespersons for many health agencies in fluoridated countries, especially in Australia, Canada, Ireland, the UK and the US. It is one thing for individuals who believe strongly in fluoridation to present one-sided arguments in favor of fluoridation, but as tax-payers we have the right to expect that health officials (who are paid by the taxpayer) would present the case objectively. Frequently they do not and resort to outrageous spin tactics. For example, Queensland Health officials, when the government there was about to introduce mandatory fluoridation in 2007, claimed that there was a 65% less tooth decay in children from fluoridated Townsville compared to non-fluoridated Brisbane. However, when the data was checked it was discovered they had a) cherry picked the data (they reported the tooth decay for one age only, 7-year olds) and b) by presenting the data as a *relative* saving rather than an *absolute* saving they deliberately misled the public into thinking that the saving was highly significant when it wasn't. The difference amounted to 0.17 of one tooth surface! If they had chosen the data for 9-year olds the saving was 0.10 of one tooth surface with a relative saving of 20%. To make matters worse they showed two photos: one for a child that had grown up in a fluoridated community (here the teeth were perfect) and one from a child from a non-fluoridated community (here the teeth were atrocious).



Ken writes:

All of these problems are probably inevitable for an issue like this where political and ideological interests operate. But they are an anathema to proper scientific consideration.

Professor Gluckman, the NZ Prime Ministers Chief advisor on Science commented that fluoridation controversies were an example of science being a proxy for values/political issues. This leads to misrepresentation of the science, cherry picking of data, and relying on confirmation bias and google for literature searches. Ideology and values are the motivating factors but a caricature of science is used in the debate.

Good faith discussion of the scientific issue around fluoridation requires much more objectivity than is usually demonstrated by the opponents of fluoridation.

Paul responds: Again I am not sure if Ken is aiming this criticism at me or the book I co-authored. If he is then I request that he shows examples from this text or my public presentations that support his claims.

I entered this exercise hoping that we could have an exchange in which we would have a “good faith discussion of the scientific issues.” I am certainly prepared to do that and I urge Ken to do the same. It would help if he stuck to addressing the arguments I raise and not to muddy the waters with the arguments, beliefs and behavior of others.

Postscript.

I am traveling in Europe at the moment and it might be a few days before I have put together part 2 of my side of this exchange titled, “The evidence that swallowing fluoride reduces tooth decay is very weak.” Those who want a head start on this can consult chapters 6-8 in *The Case Against Fluoride*.

Meanwhile, I would like to leave this suggestion for Ken and other promoters of fluoridation to consider. It is partly based on the arguments of Dr. J. William Hirzy above. Let’s assume for the sake of this argument that you prevail Ken and persuade us that swallowing fluoridated water works and was actually superior to applying fluoridated toothpaste directly to the teeth. Here is a way that you could secure that goal more effectively, more precisely and without infringing on the individual’s right to informed consent to medical treatment and without giving up the central dogma of fluoridation.

Why not make one-liter bottles of fluoridated water freely available in dental offices, pharmacies, clinics and supermarkets? These could be provided free for low-income families. In this way, you could *afford* use pharmaceutical grade sodium fluoride (because you would only need much smaller quantities); you could control the dose by telling people to drink only one bottle a day and you would not be forcing it on people who didn’t want it. Nor would you be wasting large quantities of industrial grade fluoride in other applications such as flushing the toilet nor would you be putting most of it into the environment.

Back to you Ken.

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See also

Anna L. Choi, Philippe Grandjean, Guifan Sun, Ying Zhang, 2012. Developmental Fluoride Neurotoxicity. Choi et al. *Respond. Environ. Health Perspect.* 121:a70–a70 (2013).<http://dx.doi.org/10.1289/ehp.1206192R> [Online 1 March 2013]

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Ken Perrott - November 7, 2013

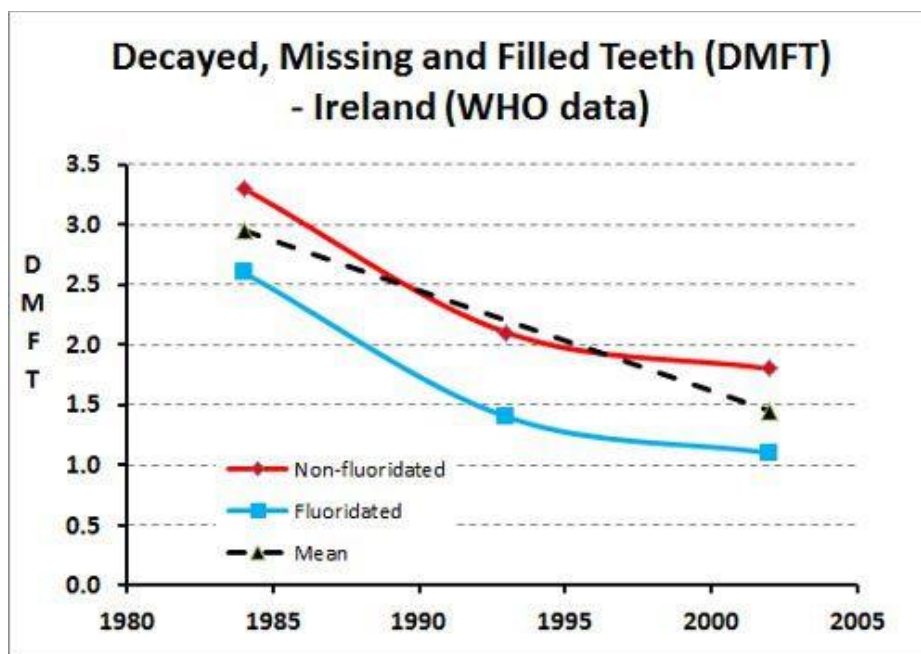
I think Paul's response illustrates some of the problems in discussions of the fluoridation issue. He shows a selective approach to data, indulges in unwarranted extrapolation from research and misinterprets scientific knowledge to fit his own agenda. In the interests of maintaining interest by avoiding repetition, I will just select a few of the more obvious examples in my response.

It is pointless to continue debating definitions of fluoride as a medicine – as I have said the argument is largely semantic. people who wish to pursue the argument should do so in a court of law.

Irish oral health data.

Paul dismisses the data I presented showing the difference between fluoridated and unfluoridated areas in Ireland because he *"would not exclude the researcher's bias influencing the result!"* That is an incredible statement because the source of the Irish data in my plot was exactly the same as that used in the plot of Cheng et al (2007) which Paul and many other campaigners against fluoridation constantly use to argue that fluoride does not contribute to the observed improvement of dental health!

In the figure below I have added the data for Ireland from Cheng et al's diagram to illustrate this. Cheng et al used the mean WHO values for Ireland (the dotted line), (and only two data points for each country) while I simply used the data for both people from fluoridated and unfluoridated areas.



I am not impressed by Paul's contradictory attitudes to the same data set. It displays a biased attitude driven by his wish to conclude that fluoridation has not had a beneficial effect on oral health.

I am also amazed that Paul should argue that with the Irish data it "*would have been more impressive and more appropriate to have compared the health status of*" the Republic of Ireland and Northern Ireland.

Surely comparison of the data from unfluoridated and fluoridated areas **within a country** introduces far fewer confounding factors than comparison of data for **separate countries**. History, culture, ethnic differences, differences in dental practice and assessments, and many other factors would contribute.

Paul shows some awareness of the problem of confounding factors when he refers to the noise in a large data set specifically in referring to Cheng et al's original plots. Yet he seems to want to increase this noise, the influence of confounding factors, in the case of Ireland and rejects an example where confounding factors have been reduced. He then implies that it is the researchers who are "biased!"

The idea that somehow inter-country comparisons should have less noise than comparisons made within a country seems so obviously wrong to me I was pleased to find I am not the only person who sees this problem. Robyn Whyman in his report "*Does delayed tooth eruption negate the effect of water fluoridation?*" puts it well:

"Studies that appropriately compare the effectiveness of water fluoridation do not compare poorly controlled inter-country population samples. They generally compare age, sex, and where possible ethnicity matched groups from similar areas. Inter-country comparisons of health status, including oral health status, are notoriously difficult to interpret for cause and effect, because there are so many environmental, social and contextual differences that need to be considered."

Contamination of fluorosilicic acid

Here Paul handed over to William Hirzy who rejected the data I presented for Hamilton city, NZ, as atypical – because the arsenic (As) concentration was so low.

See my article *Anti-fluoridation study flawed – petition rejected* for some background to Hirzy, *his paper* and the petition he organised. One of our commenters, Steve Slott, has brought to my attention that Hirzy is a "*long time avowed antifuoridationist and is employed by Connett as the paid lobbyist for Connett's antifuoridationist group, FAN.*"

In the table below I include data from 2 other certificates of analysis – in these cases Australian produced material. I also include my own data from a batch I analysed about 10 years ago when I was researching the chemical. This suggests the Hamilton sample is not that atypical, for our region anyway.

Concentrations (ppm) of contaminants in several different batches of fluorosilicic acid

Toxic Element	Impurity limits*	Hamilton City**	Incitec 08	Incitec 09	Own Anal
Sb	40	<0.09	<2	<2	
As	132	0.4	2.2	<2	2
Cd	40	0.11	<2	<1	<1
Cr	660	0.8	<2	<2	5
Hg	26	<0.05		<1	<0.1
Ni	264	<1		<2	<1
Pb	132	0.8	<2	<2	0.3

As you can see all the samples have a very low As concentration. Much lower than required by regulations for such materials used in water treatment. These samples do have a lot less As contamination than the ones Hirzy used in his study (typical value of 30 ppm). Maybe this represents the choice of samples in both cases, or maybe there are more sources of fluorosilicic acid in the US and some products have higher contamination of As. The fact that there are fewer plants producing fluorosilicic acid in New Zealand and Australia could be a reason for the apparently higher quality here.

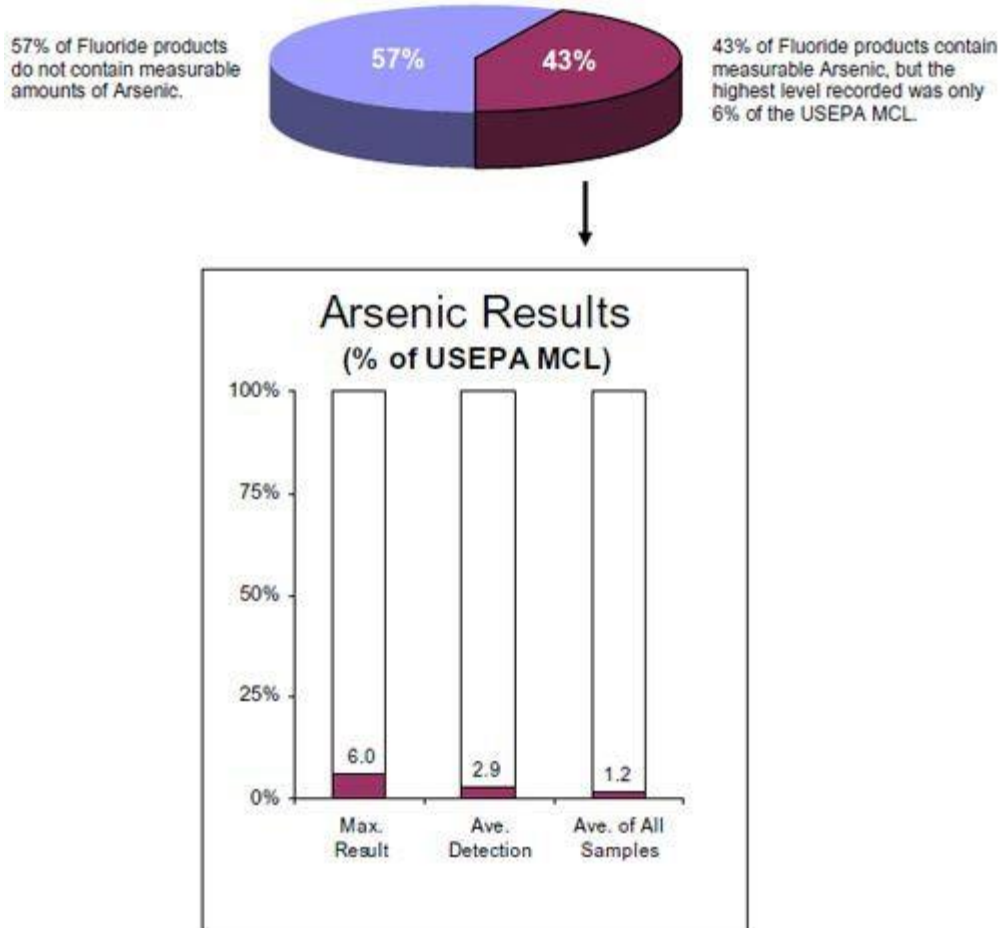
I have no way of assessing the range of As contamination in US sourced samples so don't know how representative Hirzy's choices are. The NSF analyses water treatment chemicals and state in their last *Fact Sheet on Fluoridation Products (2013)* that only 43% of the fluoridation chemicals would have produced a detectable amount of As in the finished water (actually, because of the standard methods required – detectable in water at 10 times its maximum use level). The bar graph below shows the amounts of As measured in surveyed samples as a percentage of the USEPA regulated maximum contaminant level (MCL).

Similarly, Brown *et al.* (2004) (*Trace contaminants in water treatment chemicals: sources and fate*, American Water Works Association Journal. 96: 12, 111-125) identified the coagulation chemicals used in water treatment as far more likely to introduce contaminants than the fluoridation chemicals.

Hirzy may object because the NSF measured contaminants in terms of the finished water concentrations and not that in the concentrated chemicals. The finished water concentrations were then compared to the regulated MCL. But that will simply reflect his objection to the current MCL values.

This raises an interesting issue and identifies a problem with Hirzy's approach in his campaign to substitute pharmaceutical grade NaF for fluorosilicic acid in water treatment. If the real issue for Hirzy was the As concentration he should instead have campaigned to lower the currently accepted regulations for level of contamination in fluoridation chemicals. Surely

that would have satisfied his concern about the role of As in cancers – and possibly been more acceptable to authorities. If the current approved levels are too high let's get them lowered – whatever chemical is used.



It is also interesting that the fluorosilicic acid used in Hamilton contained As contamination similar to those of the pharmaceutical grade NaF Hirzy used (typical value 0.76 ppm). He should be happy to advocate the use of material with our levels of purity in the US if his only concern is the As levels.

Perhaps we should be selling our fluorosilicic acid to the US if they cannot produce material to such standards.

Hirzy's bandwagon is the possibility of cancers resulting from As in fluoridation chemicals. I appreciate where he is coming from and have no wish to debate that issue – it is outside my area of expertise. I can only comment that in our own situation (Hamilton City, NZ) the Waikato River source water has about 3 times the recommended maximum concentration of As for human consumption (see *Hamilton – the water is the problem, not the fluoride!*). This is reduced by about 80% during treatment but still remains a bigger source of As contamination than the fluoridation chemicals – by several orders of magnitude. It would be very silly to be concerned with contamination of the fluoridation chemicals and ignore the natural contamination of the source water.

Hirzy's political activism

Finally Hirzy's activist bias concerns me in that it could interfere with proper assessment of the risks. It certainly makes it difficult not to be suspicious about his claims. Out of hand he rejects the NSF conclusions as "*a meaningless attempt at reassuring the public.*" He also similarly rejects the conclusions of the NZ Water and Wastes Association as being "*without merit.*" This is derogatory to honest and active scientific and technical workers who have made the analyses, assessed the risks and drawn conclusions. Question the regulations if you must (and no regulations are permanent) but please do that using evidence, not by "poisoning the well" with such claims. Play the ball, not the man. Hirzy would object to his own work being flippantly rejected in such a way.

His use of the silly conspiracy theory that fluoridation is a way of disposing of industrial waste also raises questions of his credibility. And he is biased to claim that regulations have no "real value" because they were violated by one treatment plant!

Normal role of F in bioapatites

Paul seems to reject the concept that F is a normal constituent of apatites, including bioapatites. He argues that it is possible to have bones and teeth without fluoride. and says "*that at the same level that fluorides interact with bioapatites it damages those bioapatites.*"

But in the real, natural world, and not the extreme conditions of the laboratory, absolutely "pure" minerals don't exist. Isomorphous substitution is normal and ubiquitous. Apatites only exist as end members like hydroxyapatite in unusual or laboratory situations. Fluoride and carbonate are very commonly incorporated into bioapatite by isomorphous substitution – as are some common cations.

In reality no bones or teeth are "fluoride free." Which is just as well because they would have higher solubility and reduced strength and hardness. Sure, this might mean that it is normal for a proportion of people to have teeth with "questionable" or "very mild" forms of fluorosis. But that is a cosmetic issue (if at all noticeable) and does no harm. It has probably been a simple fact about our teeth through our whole evolution.

For the vast majority of people who have dental fluorosis (recognised by a professional) it is usually classified as "questionable" or "mild." Real health concerns should only be raised for severe dental fluorosis. Yet anti-fluoride activists lump all those grades together and pretend that dental fluorosis is a much bigger problem than it really is.

"Topical" mechanism

We will deal with the mechanism of the beneficial role of fluoride on teeth in later articles so I will just respond briefly to Paul's brief reference to the issue in his last article here. He claims the US Centers for Disease Control and Prevention (CDC) agrees "*that the predominant benefit as far as protecting teeth is concerned is topical (rather than systemic).*"

(Actually, he says “concedes” and not “agrees” but this word is ideologically loaded). That is correct as far as it goes but we should remember that this is referring to existing teeth – ingested fluoride still has a beneficial role with bones and pre-erupted teeth. The word “predominant” is important. So I can’t help recognise the bait and switch tactic when, in his book, he drops the word “predominant” in his chapter summary and he says:

“For many years, fluoride was believed to act systemically to prevent caries— tooth decay— by being incorporated into the enamel of the developing teeth. However, it is now known to act topically—that is, at the surface of the tooth. Thus, the main reason for ingesting fluoride has disappeared . . .”

Again and again I find anti-fluoride people using this tactic to deny **any** mechanism but “topical.” They thereby purposely deny any of the known beneficial effects of ingested fluoride.

This bait and switch tactic is compounded by another bait and switch where the “topical” – referring to the reactions occurring at the tooth surface because of fluoride in saliva and biofilms – becomes a new “topical” – referring only to methods of application such as toothpaste and dentrifices. This tactic enables them to deny the beneficial roles of fluoride transferred from water to saliva during drinking, as well as that ingested.

Anti-fluoride activists pushed this misrepresentation hard during recent hearings on fluoridation at the Hamilton City Council in NZ. It had its effect when the Council took on itself to issue a leaflet giving oral health advice. This repeated the “topical” misinformation. Health and dental experts were publicly very critical of the leaflet and Hamiltonians felt embarrassed by the Council’s hubris.

Fluoridated toothpaste only complements, does not substitute for, this regular “top up” of saliva F during drinking and eating.

Perhaps we should be referring to “surface” mechanisms rather than “topical” ones as the latter is so easily seen as applying only to application methods.

Extrapolation from high concentration animal studies

I think Paul’s confidence in unsupported extrapolation from higher concentration animal studies is very cavalier. Paul claims:

“in the case of fluoride it is well known. That you have to give 5 to 10 times as much fluoride to rats to reach the same plasma level as you need in humans.”

He doesn’t support this with a citation – but I suspect that would only be to a similar assertion in Fluoride Alert or a sister web site, with no, or poor, literature reference.

The US National Research Council report *“Fluoride in Drinking Water – A Scientific Review of EPA’s Standards”* discussed the contradictory data used for attempting to show a ratio between humans and rats for blood plasma levels and concluded:

“Dunipace et al. (1995) concluded that rats require about five times greater water concentrations than humans to reach the same plasma concentration. That factor appears uncertain, in part because the ratio can change with age or length of exposure. In addition, this approach compares water concentrations, not dose. Plasma levels can also vary considerably both between people and in the same person over time (Ekstrand 1978).”

I am suspicious of attempts to use comparison of blood plasma F levels for such justifications because of the huge range and variability of these levels. This sort of speculation seems to fuel the frequent use of the word “might” in Paul’s article (and attempts to convert such logical **possibilities** to **realities**) and in the end leads to the speculation being present as a fact (Paul’s “well-known” and the simple FANNZ declaration).

But Paul at least refers to one study on rats using drinking water with F concentrations closer to those of fluoridated water – Varner et al (1998). Unfortunately I could not get the full text of this paper and the link Paul provides to <http://www.fluoride-journal.com> does not allow access to mere mortals like me. In my search I was amazed how links promising full text of papers like this often just take one back to Fluoride Alert and their in-house interpretation.

The abstract mentions changes in cerebrovascular and neuronal integrity for AlF₃, and to a smaller extent for NaF. As I can’t access the discussion to understand the possible significance of these small changes I won’t comment further on this.

Why do countries not fluoridate

Paul describes my consideration of the various reasons behind the decisions of countries not to fluoridate their community water supplies as *“more like self-serving political spin than reality!”* That is rather harsh – considering he then goes on to claim only 2 main reasons – freedom of choice and health concerns. **Using his own article as a reference!**

No, I won’t respond by selecting personal statement from citizens of the non-fluoridated countries as he asks. But here is an outline of the situation with fluoridation throughout the world taken from a recent issue of the newsletter of the New Zealand National Fluoride Information Service. It gives a pretty detailed picture:

Countries with widespread water fluoridation programmes include Australia, the United States of America, Canada, the United Kingdom, Ireland, Spain, Israel, Brazil, Brunei, Chile, Argentina, Colombia, Hong Kong, South Korea, Singapore and Malaysia. Countries with limited water fluoridation programmes include Vietnam, Fiji, Papua New Guinea, and South Korea.

Several countries are unable to introduce water fluoridation programmes due to technical, financial or sociocultural reasons. As an alternative, both salt and milk have been found to be reliable and convenient vehicles for increasing fluoride intake to an optimal level for hard to reach and low socio-economic communities. Studies have found them to be as effective as community water fluoridation schemes.

Some European, Latin American, and Caribbean countries, including France, Switzerland, Germany, Costa Rica, Colombia and Jamaica currently use fluoridated salt schemes. Mexico

and most Latin American and Caribbean countries (apart from Argentina, Brazil, Chile and French Guyana) have or have had salt fluoridation programmes.

A smaller number of countries currently have fluoridated milk programmes, including Bulgaria, Chile, China, Peru, Russia, Thailand and the United Kingdom

Some country regions have optimal amounts of naturally occurring fluoride which provides good protection for oral health. examples of countries supplied with naturally fluoridated water at or around the optimum level needed to prevent dental decay include the United Kingdom (estimated 329,000 people), United States of America (estimated 10,078,000 people) Canada (estimated 300,000 people) and Australia (estimated 144,000 people).

It is estimated that 39.5 million people around the world have access to naturally fluoridated water at the optimal level although variations from one community to another over time make it difficult to calculate an accurate total.

Reasons for not fluoridating water supplies and/or using alternative ways of overcoming fluoride deficiencies are simply not restricted to attitudes towards freedom of choice and health concerns, although they may have been deciding factors for a few countries. This is another instance where opponents of fluoridation are making widespread simplistic claims (like Europe bans use of fluorosilicic acid) based on only a few facts, and ignoring (or hiding) the details.

We should also remember that despite different decisions by governments and local authorities about implementation of fluoridation all the reputable national and international health bodies do accept the scientific consensus of the beneficial role of fluoride in oral health. It is this endorsement which is more relevant to us than the specific technical, political or social decisions made in other countries.

Political activism

I am glad Paul rejects extremism among anti-fluoride activists. However this does not seem to stop him cooperating with extreme conspiracy theorists like Alex Jones and Vinny Eastwood to produce videos. (Have a look at *Cyber bullying of science*, which includes a recent video of Eastwood's attacking scientists and science, to get an idea of how silly these people can be). People do notice such associations and draw their own conclusions. Paul appears to give some justification of "*the more nutty conspiracy theories espoused by some opponents of fluoridation.*" He says "*promoters of fluoridation should not be surprised that some people are trying to come up with a rational explanation for why certain governments are behaving so irrationally promoting this practice.*" Well that is his perspective and it is a minority one. I certainly don't accept such justifications because I, and many others, have no trouble understanding the decisions to fluoridate.

Misrepresentation of the facts is a real problem among activists of all persuasions. That is understandable because ideological and political convictions and motivations can distract

even the most honest people. Paul presents an example of an image that illustrates this for some supporters of fluoridation.

This image seemed to create a lot of controversy among local Facebook pages and I got the blame because it was posted on this blog. I have been assuring complainants that it is not my image and I do not support its implied message. It seems to have been taken from a document prepared under the Queensland Health logo. I cannot find a source and no-one seems to be able to give a citation. It is not on the [Queensland Health web site](#). All Internet references seem to be in documents and sites of fluoridation opponents – indicating that it has backfired as a propaganda exercise for fluoridation. I gather it may have been prepared to send to selected Australian members of parliament at some stage.

Paul has sent me a copy of the document which interested readers can [download](#).

But here is the trouble for those living in glasshouses who wish to throw stones. This sort of misrepresentation is probably more common among opponents of fluoridation. The figure below, for example, is from a document of the “Queenslanders for Safe Water” website which ironically included and criticised the Queensland Health photos! (Thanks to commenter Steve Slott for the link). It uses photos of extreme skeletal and dental fluorosis to argue against fluoridation.

This, and the Queensland Health photos, are extreme exaggerations used to promote a message. Reasonable people should condemn that tactic. But isn't this, in essence, the same tactic used by Paul and other opponents of fluoridation when they extrapolate from animal studies at high concentrations, characterise the relatively common very mild and “questionable” cosmetic fluorosis as if it were severe, use the “topical” mechanism to argue that fluoridated water has no influence, wildly exaggerate the concentration of toxic contaminants in fluoridation chemicals, persistently and inappropriately describes fluoride a poison and a neurotoxin, misrepresent the reasons why some countries do not fluoridate their water supplies and deny data illustrating a beneficial effect of fluoride on oral health as “biased?”

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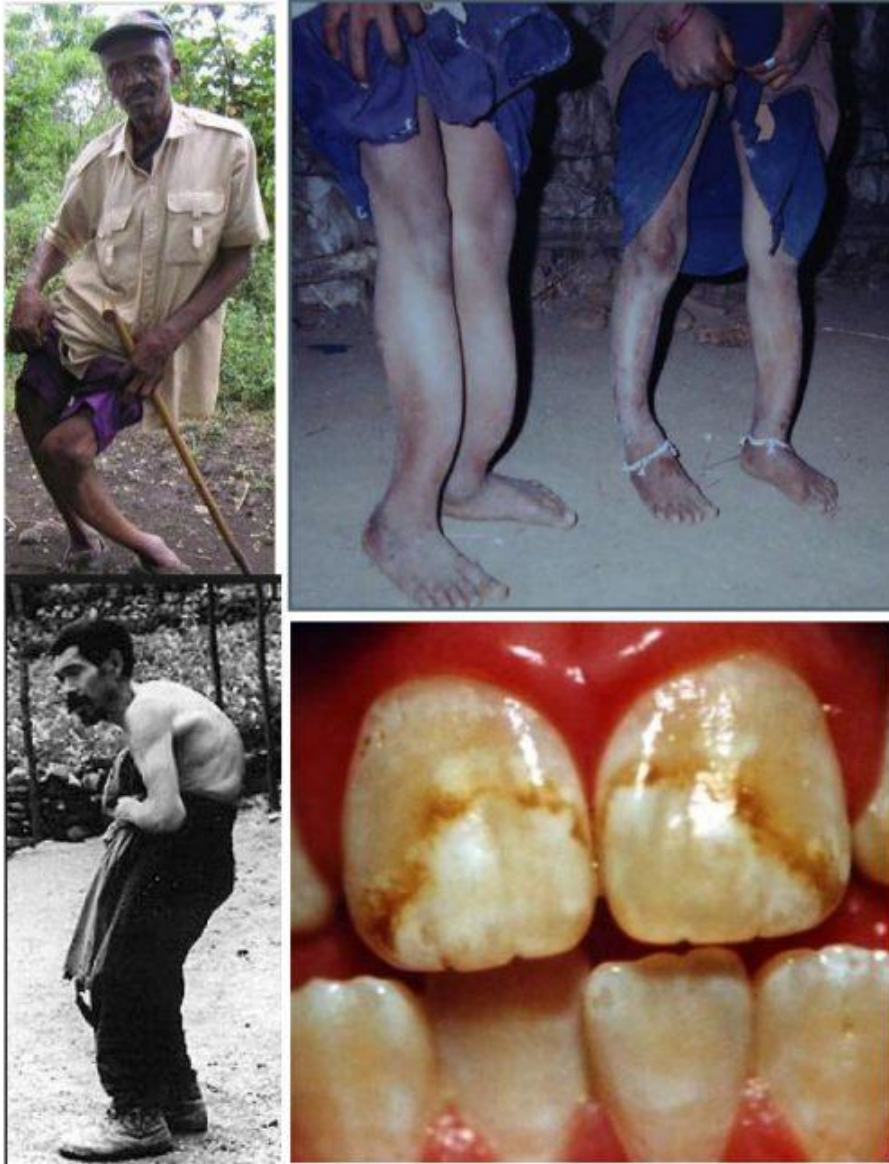
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Why I Support fluoridation: Ken Perrott - November 11, 2013

So far, our exchange has only covered some arguments against fluoridation and responses to those arguments. Some readers feel we should have started with me advancing the arguments for fluoridation. For example one commenter, Alison, said

“readers haven’t had the opportunity to see the basic arguments favoring fluoridation as you see them. . . . we are genuinely perplexed about why this practice has continued and honestly and sincerely trying to further or understanding.”

Paul Connett made a similar remark in his last article:

“promoters of fluoridation should not be surprised that some people are trying to come up with a rational explanation for why certain governments are behaving so irrationally promoting this practice.”

I can’t understand why anyone should be perplexed or think fluoridation is irrational. But I am happy to give my reasons for supporting fluoridation – but remember it is a personal perspective as I can’t speak for everyone who supports it. My perspective derives from several issues that are important to me – the science, defence of science against anti-science elements, social concerns and the provisional nature of knowledge.

Scientific acceptance of fluoridation



New Zealand agriculture dependent on science and correction of deficient micro-elements. Photo credit: [Farm Forestry NZ](#)

We have many advantages in New Zealand, despite our social, economic and political problems. The climate, our scenery, our people (who are generally open-minded, liberal and accepting), agriculture and food. But our agriculture and food, and the rest that depends on these, has only really been possible because of the application of science to solve problems with the land we inherited.

New Zealanders accept the need to correct nutrient and micro-element deficiencies because we realise their importance to our place in the world. The correction of cobalt deficiencies in our central volcanic region of the North Island/Te Ika-a-Māui had huge economic returns. We also took steps to correct other important deficiencies like molybdenum, copper and selenium. Discovery of the role of fluoride in oral health, and that we had a deficiency which needed correction, was hardly a surprise to us. Nor did most of us find the solution unusual.

In the mid-1960s I worked at Soil Bureau, DSIR, outside Wellington, and remember some of the early discussions around fluoridation – there was some debate then about the possible role of the micro-element molybdenum, rather than fluoride, in limiting tooth decay. Later my research developed further into the nature of phosphate and its reactions in soil and the fluoride story really made sense. I became aware that the primary minerals of phosphate in soils were apatites which had fluoride as a natural constituent. This small amount of fluoride imparted important properties to the apatites – lowering their solubility and increasing their hardness which helped prevent weathering losses.

So it is understandable I could see how fluoride improved oral health (bones and teeth are bioapatites). In my research reading I also found many dental research papers were very useful. Looking back I can, for example, remember the discovery like of the role of fluoride in inhibiting dissolution of apatites by a surface reaction in partly acidulated rock phosphate fertilisers. This parallels similar discoveries about the role of surface reactions of fluoride in saliva inhibiting tooth mineralisation and reducing tooth decay.

So the efficacy of fluoridation as a social health measure was a no-brainer as far as I was concerned. But about 10 years ago I had a sort of road to Damascus moment about the political issues when working on a research project involving fluorosilicic acid. My analysis of this material (the same used in New Zealand for water fluoridation) revealed the concentrations of contaminants like arsenic were very low – contrasting sharply with the claims of activists campaigning against fluoridation (whose story I had sort of accepted till then). That left me with a healthy respect for evidence, and a corresponding suspicion of ideologically motivated activists, in these sorts of public debates involving scientific issues.

Defence of science

I guess most scientific researchers have, at some stage, to meet the activity of anti-science sympathisers and activists. Evolutionary biologists have a permanent battle defending their science against creationists. There has been huge political pressure imposed on climate scientists. Surprisingly, even scientific researchers in agriculture periodically face this problem. Quacks selling snake oil seem to be able to find a market with farmers selling

alternative fertilisers, etc., just as they can on health issues. Ideology also intrudes, with debates over organic farming and use of chemicals in agriculture.

Often these conflicts are not simply black and white. The last two examples are complex. There is a role for organic farming and there is certainly need to lower chemical inputs into agriculture. These issues get sensibly debated and have their own scientific support. But agricultural scientists have often had to face the problem of more highly motivated and ideologically driven detractors with more extreme views.

These anti-science people and groups can often be very effective politically and will skilfully use the mass media and the new social media – blogs, Twitter and Facebook. Very few scientists have experience with, or a liking for, this form of public relations and easily lose such media debates. Scientists don't willingly get their hands dirty in such public relations battles. It is interesting to speculate why – but that is a subject for another time. One barrier I was aware of during my career was the limits and control placed on individual researchers by their institution. Institutional politics often over-ride the freedom of researchers to defend their work and take part in social debates about it. Institutions encourage scientists to keep their heads down when attacked and not retaliate. The institutional fear of such social engagement possibly results from fears of legal action.

I am now retired and this has at least one advantage – freedom from institutional constraints. Mind you, if a retired scientist is involved with paid consulting, advocacy or lobbying, then they have another form of constraint which is probably more direct and rigid than that imposed by a research institute. Because consulting, advocacy and lobbying usually need prior commitment to an idea, product or policy - payment is made for endorsement or justification and not research.

In my case I have not had to rely on such extra income so have had the freedom to explore my interests, and express my opinion without censorship or control. I have enjoyed the freedom to read and research ideas and to follow my nose in a way intensive paid research does not allow because it is so focused.

Inevitably I have been attracted to some of the more controversial areas – controversial politically, not necessarily scientifically. Such as the religion-science conflict, evolution, climate change and, more recently, fluoridation. I have participated in on-line debates on these issues, and about 7 years ago started this blog. None of this would have been possible while I was employed, or if I had got into paid consulting or advocacy during my retirement.

Despite my interest in the chemistry around the fluoridation issue I did not get involved in any public discussion until earlier this year. My city, Hamilton, held a referendum in 2006 which overwhelmingly supported fluoridation. I was aware the issue was coming up again and assumed we would have another referendum this year. That was OK by me – but, like many Hamiltonians, I was shocked to hear in June that the local council had decided to stop fluoridation without a referendum. Yes, they held hearings beforehand and had last year reversed their decision to send the issue to referendum again – but most citizens were just not aware of this going on. Many of us felt it was done behind our backs.

In New Zealand decisions on fluoridation are left to local councils – because they are the ones managing the treatment plants. Most councils really don't feel they should be making those decisions – that this should be the responsibility of central government and health ministries. However, that is the way it is.

While other decisions on water treatment don't go to referendum, or get decided by councils, fluoridation attracts controversy – there have been regular campaigns by activists opposing fluoridation. I don't think citizens think councils should make decisions about health and science – that is not their job. Councils should instead reflect the views of the community on such issues. Personally, I think if a community opposes fluoridation that should be enough. While I accept that the person in the street does not understand the science (why should they) and may be prone to chemophobia or misinformation, if they are so inclined it should not be imposed.

In the end sensible citizens will take advice on such issues from scientific and health experts – not local council politicians.

So I guess my interest in the political issue was sparked off by what I saw as a violation of democratic rights. As I reacted and started to comment on line and write to councillors about the injustice I became more and more aware of just how badly the science around this issue was being distorted by anti-fluoride campaigners. So, we had a repeat of the evolution and climate change debates. There was a battle about the science behind fluoridation and I had to get involved.

As with these other issues a strong motivation for me is the integrity of science. The need to challenge and expose distortions about the science. But fluoridation is also an ethical and social health issue which raises a human rights motivation for me. In particular I find some of the hostility towards fluoridation repugnant because it demonstrates a complete lack of understanding of what life is like for the economically and socially disadvantaged in our society. In fact, it often demonstrates a complete lack of empathy for their situation.

Social concerns

This not the place for discussing the details (and that is very difficult anyway) but I come from a socially deprived background and have some understanding of what it is like for people caught in such social and economic traps. I believe more people are actually in that situation than political activists, or politicians in general, realise. Partly because socially and economically disadvantaged people are usually incapable of advocating for their interests, and partly because the rest of society prefers to turn a blind eye, or to otherwise deny the problem.

But these problems exist, and they affect all of us. If a section of society cannot reach its potential for social, economic and psychological reasons that affects us all. It often means more people dependent on state social and financial help. Fewer people getting the education

and becoming the experts needed to make our society better. These problems increase the health costs which end up being paid by us all through our taxes.

Social health policies, like fluoridation, are actually very cost-effective. They help reduce what the whole of society must pay in their absence. Probably more important from my perspective, they are humanitarian. They help rescue children and adults from otherwise hopeless situations.

Poor oral health is a huge burden for the individual. Toothache is unbearable for children, who do not have the power to ease their situation. In later life the inevitable cosmetic consequences affect the individual socially. Destroying their confidence, inhibiting their employment and other social opportunities.

Believe me, I am just as big an advocate for personal freedom of choice as the next person. But in the real world this needs to be balanced against social good. To dogmatically stress one at the cost of the other is just political extremism. And this is rejected by most people in today's democratic, empathetic and pluralistic society. Most people accept that social health programmes benefit the whole of society, financially and ethically.

Provisional nature of knowledge

I have not dealt here with any of the many arguments used against fluoridation. This was meant to be a positive article, dealing with the argument for this practice. I expect it will bring out many of the arguments against fluoridation in the comments and response and I can respond to them then.

I don't wish to ignore the criticisms of fluoridation – far from it. But I do want to make my own judgements on them intelligently and critically. I think that is the correct scientific approach. And my own experience has taught me that criticisms can be wrong, ideologically motivated or just plain untrue. The example of the claimed contaminants in hydrofluoric acid illustrates this.

I also recognise that humans are not really a rational species, more a rationalising one. Confirmation bias is a natural result of the very human activity of pattern seeking. We are all prone to logical fallacies, selective viewing, and biased interpretation. Scientists are no exception, but at least the scientific ethos of demanding evidence, checking ideas against reality and submitting conclusions and theories to the critique of one's peers help to reduce (but not eliminate the problems),

Ideology and strong convictions get in the way of intelligent and critical assessments. Personally I think this problem is rife among anti-fluoride activists. They are a socially and ideologically diverse group but philosophies of alternative health, alternative medicine and treatments, opposition to establishment ideas for its own sake, conspiracy theories of one sort or another and a long-term component of extreme right-wing politics are all present. In saying that I am not denying the many honest and sensible people who may have concerns

about fluoridation for one reason or another. Hopefully it is the latter group which will engage in discussion here.

I am definitely ready to honestly assess the criticisms and arguments made by opponents of fluoridation – especially if presented in good faith and a non-hostile way. One thing that a career in scientific research teaches is that we are often wrong. Discovery is about making mistakes, discovering one has been wrong, seeking further evidence and adjusting one's ideas and theories. I can recall situations where experimental results have proven me wrong and I felt enthused because that mistake, and my discovery of it, opened things up to new discoveries. In effect, whether we personally intend it or not, scientists do experiments with the express purpose of proving themselves wrong. After all, the best experimental evidence one can offer for a dearly loved theory is one that would test it properly and show it wrong if that is the case.

That is why I have chosen the name Open Parachute (*“your mind doesn't work if it is closed”*) for the blog and adopted the slogan - *“if you have not changed your mind in the last few years – check your pulse, you may not be alive.”*

I am certainly open to changing my mind about fluoridation. But that change will need evidence, good evidence. And honest, intelligent interpretation of that evidence.

So criticise what I have written here. Present your arguments against fluoridation. But please do so in good faith. I am not going to be convinced by name calling or hostility. Unwarranted extrapolation from studies done at high concentration are a dime a dozen and worthless in this debate. And misrepresentation of the literature is counter-productive because I do like to check. I have seen too many examples of distorted interpretation and misinformation to take such assurances on trust any more.

Paul Connett - November 14, 2013

I think your opening statement certainly gives us a perspective from where you are coming on this issue Ken and that is helpful.

I am very glad that you put “having an open mind” and “relying on science” as your key tools for resolving controversial issues like fluoridation. I believe that once you have got over some negative impressions that you have had with some people opposed to fluoridation, that you will find that having an open mind and relying on the best science will inevitably lead you to rejecting fluoridation and to see it as the misguided practice it is. But we shall see.

As far as the case you present I find it very, very short on science. Basically you argue that fluoride is needed to react with our bio-apatites and make them stronger, less soluble and in the case of teeth less vulnerable to tooth decay. You offer no scientific evidence that interaction with the bones is beneficial and can be achieved without damage to the bone or the connective tissue.

Your case as far as the teeth are concerned seems to boil down to the need to put fluoride in the drinking water so after passing through the whole body it ends up in our saliva and that this is the delivery system which reduces tooth decay. Two questions: 1) Why do you feel that this is more rational and suitable than treating the tooth enamel more directly with topical treatments like fluoridated toothpaste? 2) If you reject topical treatment for some reason and you insist the fluoride must be swallowed to be effective why don't you use a more appropriate way of delivering fluoridated water, i.e. in one liter bottles at 1 ppm and prepared with pharmaceutical grade sodium fluoride?

I asked this latter question at the end of section 1A but in your response you did not answer. So may I ask it again? Would not this delivery system provide, 1) a better control of the dose, 2) a far better control over the purity of the chemical used and 3) would not force this human treatment on people who don't want it. Nor would it involve giving up on the central dogma of water fluoridation. Surely this would be a win-win situation for everyone?

On the ethical front, you stress the need to help disadvantaged children. No argument there from me. But what if your chosen method actually further disadvantages these children and their families? What for example are parents in low-income families supposed to do if they *don't want* their children to drink fluoridated water? Haven't you trapped these families with this policy? Moreover, are you not aware of the extensive literature from India that fluoride's toxic effects are more serious for people with poor nutrition (low protein, low vitamins and low calcium – see the early work from Pandit et al., 1940 and the more recent animal studies from Chinoy, NJ – see the FAN bibliography for full citations, <http://fluoridealert.org/researchers/fan-bibliography/>)? Aren't children in disadvantaged communities more likely to have poor nutrition?

Scotland, which has no fluoridation, has found a simple and cost-effective alternative way of fighting tooth decay as this recent BBC Scotland report indicates (<http://fluoridealert.org/news/nursery-toothbrushing-saves-6m-in-dental-costs/>):

“A scheme to encourage nursery children to brush their teeth has saved more than £6m in dental costs, according to a new study.

Childsmile involves staff at all Scottish nurseries offering free supervised toothbrushing every day.

Glasgow researchers found that the scheme had reduced the cost of treating dental disease in five-year-olds by more than half between 2001 and 2010.

The programme was launched in 2001 and costs about £1.8m a year.

It emphasises the importance of toothbrushing and helps parents establish a healthy diet from the earliest stage.

A number of nurseries and schools in targeted areas also provide fluoride varnish and toothbrushing in primary one and two.

An evaluation, funded by the Scottish government and carried out by Glasgow University, found that fewer children needed dental extractions, fillings or general anaesthetics as a result of the programme.

‘Less toothache’

There was also said to be a drop in the number of children needing hospital treatment for dental problems, freeing up operating theatres.

Public Health Minister Michael Matheson said: “This is an amazing achievement and shows just how much can be saved from a very simple health intervention.

“This has seen less tooth decay in children which means less toothache, fewer sleepless nights and less time off school.

“By this simple measure, NHS costs associated with the dental disease of five-year-old children have decreased dramatically.

“More children can just be treated routinely in the dental chair because they need less invasive treatments, so fewer fillings and fewer extractions, and many more children with much better oral health than we have seen in many years.”

For the second time you state your concerns about, “Unwarranted extrapolation from studies done at high concentration” which you say are “a dime a dozen and worthless in this debate.”

Last time you brought this up I responded by showing that several human IQ studies were *not* done at high concentrations. For example, in *nine* of the 27 IQ studies reviewed by Choi et al

(2012), the high fluoride village was at 3 ppm or less. I also went into more detail on the study by Xiang et al. (2003a,b) who found a threshold at 1.9 ppm for this effect.

In my discussion on this point I stressed the difference between *concentration* and *dose* and the need to consider a margin of safety calculation to protect for the full range of expected sensitivity or vulnerability in a large population when extrapolating from a small human study of a fairly homogeneous population. Thus extrapolating from Xiang's study we find that there is absolutely no margin of safety to protect either for the *range of exposure* to fluoride in an American or NZ population or for the *full range of sensitivity* expected in any large heterogeneous population. This latter calculation is particularly important for your major concern – disadvantaged children – because that is almost certainly where you will find the most vulnerable in this regard.

When we embarked on this exercise I thought that this was going to be an exchange between yourself and me, but I am finding that you do not want to restrict yourself to my arguments but want to argue against all the arguments thrown at you by people opposed to fluoridation. That has a place of course but it was not what I was expecting. In my view it serves to distract and muddy the waters.

I wish you had taken a more disciplined approach and focused entirely on the arguments I have put forward. In this respect it is unfortunate that when you were educating yourself on this issue you did not take advantage of reading the book I co-authored with two other scientists, James Beck, MD, PhD and Spedding Micklem, DPhil (Oxon). There we spelled out the case in a cool, calm and collected way with every argument backed up with citations to the scientific literature. As you know – but your readers may not – I sent you a pdf copy of this text. By so doing, I had hoped that we could keep this debate tightly focused; that I could defend my own arguments (and there is plenty enough of those) and not have to keep considering those of others.

Your readers might also not know that shortly after this book was published (Oct 2010) I was invited in early 2011 to meet with staff of the Ministry of Health in Wellington. About 20 people were there from the Ministry and some of their advisers. I carefully went through the arguments in the book and asked them at the end of my presentation to provide a written response to the book showing where I was wrong and providing the science that supported their critique. I added that if they could not do this with all the resources and personnel at their disposal then they should not continue to promote this practice. After nearly 3 years I still have not received that written critique. Meanwhile, personnel from this Ministry, including the Minister himself, continue to promote the practice and even accuse opponents of distorting the scientific arguments – with no specific examples to which someone like myself could respond.

Blanket condemnation of opponents gets us nowhere. Nor does it help to keep knocking down straw dummies. The debate will only be seriously engaged when the proponents begin to put forward and defend the studies that have convinced them that fluoridation is both effective and safe – and safe for everyone. This is what opponents like myself have done.

This was what I was expecting from you Ken when you got the opportunity to put forward your case. Surprisingly, you gave no scientific citations at all. Hopefully, these will come later.

Rather than take up any more space at this point I will wait for part 2 of your case, where I hope you will present some science to support this practice.

While you are doing this I will prepare my response to your response to my section 1A.

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Ken Perrott -November 17, 2013

First this issue of science and citations? Yes, my last article was general and concentrated on the philosophy of science and social aspects – both of which are important to me and central to why I support fluoridation. But Paul seems not to have appreciated or understood my first section on scientific aspects so I will develop part of that, the nature of fluorine in apatites, further here. I will throw in a few citations just to keep Paul and my other critics happy (more on the use of citations later).

Apatites contain structural fluoride

I briefly referred to the nature of apatites and the occurrence of fluoride as a natural constituent. Paul seems not to get this as he again refers to fluoride as something external, and not a natural, normal, part of apatites. He is mistaken in his belief that I claim “*that fluoride is needed to react with our bio-apatites and make them stronger, less soluble and in the case of teeth less vulnerable to tooth decay.*” (My stress).

I don't claim that at all. I argue that apatites, including bioapatites, are not pure end members such as hydroxylapatite, but naturally (and normally) contain species like F and carbonate as part of their structure. isomorphous substitution of these species for phosphate and oxygen occur during formation of the apatite compounds. This isomorphous substitution of F for O strengthens the apatite and lowers its solubility compared with the hydroxylapatite end member. Carbonate substitution for phosphate can have an opposite effect – things are never simple so there is a balancing act which makes isomorphous substitution of fluoride even more important. The bioapatites in our body contain both F and carbonate as normal, natural components (see figure below). The incorporation of ions like fluoride into bioapatites can change their solubility product by several orders of magnitude according to Driessens (1973). Planer at al (1975) attributes the improved stability of bone to “*the isomorphous substitution of fluoride in the apatite structure.*”

(None of this denies the negative effects of excessive fluoride intake on our bones and teeth).

$\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$ - Hydroxylapatite end member

$\text{Ca}_{10}(\text{PO}_4)_6(\text{OH},\text{F},\text{CO}_3)_2$ - The real world

$\text{Ca}_{10}(\text{PO}_4)_6(\text{F})_2$ - Fluorapatite end member

This is why Wopemka and Pasteris (2005) argue “*the apatite phase in bone should not be called hydroxylapatite.*” This is also the reason why there are “*limitations to the use of the stoichiometric mineral hydroxylapatite as a mineral model for the inorganic phase in bone.*”

I second this and find unfortunate the simplification we often see in more general texts where bioapatites are discussed as if they were the end members hydroxylapatite or fluoroapatite rather than an intermediate hydroxyl-carbonate-fluoroapatite of somewhat variable composition.

The fluoride we ingest is involved in the formation of bioapatites right from the beginning. This is why we see increased risks of weakened bones and teeth when dietary fluoride intake is insufficient. It can also be lost from actively growing bones and other bioapatites when fluoride intake is reduced. See [Kurland et al \(2007\)](#) for an example of the reverse of fluorosis (probably caused by surreptitious ingestion of toothpaste) once fluoride inputs had been reduced.

Understanding the complex nature of bioapatites and the effect of composition on structure and strength is important to appreciating the role of ingested fluoride on producing healthy bones and teeth. Unfortunately this aspect is often neglected, or purposely overlooked or hidden, when attention is concentrated on the mechanism of surface reactions of fluoride with existing teeth in inhibiting tooth decay.

However, some researchers are stressing that the beneficial effect of fluoride arises from effects of ingested, or systemic, fluoride on pre-eruptive teeth as well as surface reactions on existing teeth. [Newbrun \(2004\)](#), for example, stressed in a review of the systemic role of fluoride and fluoridation on oral health:

“The role of systemic fluoride in caries prevention is neither “minimal” nor “of borderline significance.” On the contrary, it is a major factor in preventing pit and fissure caries, the most common site of tooth decay. Maximal caries-preventive effects of water fluoridation are achieved by exposure to optimal fluoride levels both pre- and posteruptively.”

I will now discuss those surface reactions.

Topical confusion once again

Having dealt with this issue twice now (admittedly only briefly) I am surprised Paul could interpret my understanding of the beneficial role of fluoride on teeth as requiring:

“the need to put fluoride in the drinking water so after passing through the whole body it ends up in our saliva and that this is the delivery system which reduces tooth decay.”

I have never claimed that at all. Still, local anti-fluoride activists accuse me of this despite my many specific refutations. Paul’s characterisation of the “topical mechanism” is common among such activists and, as I said in a [previous article](#), an example of a bait and switch fallacy.

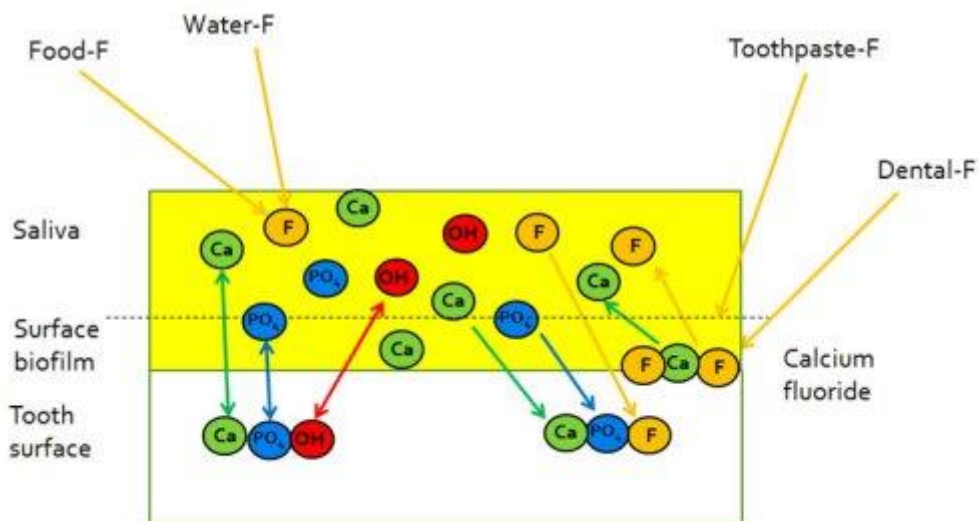
Earlier this year I wrote about the so-called “topical” mechanism and the way it was being misrepresented by anti-fluoride activists in two articles - [Fluoridation – topical confusion](#) and [Topical confusion persists](#). I will just repeat myself a bit here to clarify.

The US Center for Disease Control describes this “topical” or surface mechanism in its report *Recommendations for Using Fluoride to Prevent and Control Dental Caries in the United States*:

“ . . . drinking fluoridated water, brushing with fluoride toothpaste, or using other fluoride dental products can raise the concentration of fluoride in saliva present in the mouth 100-to 1,000-fold. The concentration returns to previous levels within 1–2 hours but, during this time, saliva serves as an important source of fluoride for concentration in plaque and for tooth remineralization.”

So let us be clear, they are referring (in the case of fluoridated water) to fluoride ions transferring from the water (or food) to saliva (and biofilms on the teeth). There is no assumption that the salivary fluoride must come only from ingested fluoride after “*passing through the whole body.*” The latter, of course happens, but contributes a smaller amount. There are literature reports that this lower concentration can also contribute to the “topical” mechanism – but I am not myself advocating that as necessary.

The diagram below portrays this – the fluoride is going directly from the drink and food into the saliva:



Tooth decay occurs because when the pH at the tooth surface is lowered (this happens when bacteria decompose sugars and other carbohydrates) some of the calcium and phosphate in the bioapatite at the tooth surface dissolves – mineralisation. With time the pH increases and the reaction is reversed – calcium and phosphate ions at the tooth surface reform as a solid hydroxylapatite surface phase (remineralisation). The acidity (or pH) is an important factor in the dissolution and precipitation of apatites.

When fluoride is present at the tooth surface a fluorohydroxyapatite is formed in the surface phase. This is “harder” – it doesn’t dissolve as readily. Consequently the incorporation of fluoride into the tooth surface reduces mineralisation – and enhances remineralisation. It inhibits tooth decay.

Fluoride in fluoridated water and food does this very effectively. Because we drink and eat often, dietary forms of fluoride help to maintain a useful concentration of saliva fluoride over time.

Topical **application** methods (toothpastes and dentrifices) are a supplement to fluoridated water and dietary fluoride, but not a substitute – partly because they are not applied as often (if at all). However, dentrifices and dentist’s fluoride treatments may cause formation of CaF_2 globules on the tooth surface (because of the high F concentration) which then slowly release their F over time to maintain saliva concentrations at an appropriate level (see the review article *Mechanisms of Action of Fluoride for Caries Control* by Buzalaf, Pessan, Honório, and ten Cate JM (2011)).

The “topical” or surface mechanism which operates with fluoridated water is effective because it is regular (much more regular than **topical application** methods) and this helps maintain fluoride concentrations in saliva and tooth biofilms at effective levels.

Incidentally, this is also a reason water fluoridation is an effective social health policy. It means that the whole population can and does access the “topical mechanism” without thinking about it (as is required with toothpaste, mouth rinse and dentist fluoride treatments).

In summary, science supports both a systemic and a surface (“topical”) role for the beneficial effects of fluoridated water.

Benefits for bones

Paul asks for “*scientific evidence that interaction [of fluoride] with the bones is beneficial.*” As I described above that question actually misrepresents the situation. It is not the interaction **with bones** that is important but **incorporation into bones** during their formation and growth. Fluoride does not have to “react with our bioapatites,” as Paul puts it. **The fluoride is a component of the bioapatites** - See first figure above.

There are numbers of scientific papers that can be cited to show a beneficial role for fluoride in bones. I will just refer here to [Li et al \(2001\)](#) (full text [here](#)) because it does offer a useful graphic demonstration of that beneficial effect – in this case of the overall incidence of bone fractures. Figure 2 from this paper below shows that the incidence of fractures is lowest at concentrations similar to that used for water fluoridation, with increased incidence at both lower and higher concentrations.

Incidentally, one of our commenters Kurt Ferre [draws attention](#) to the fact Paul Connett is aware of this paper – at least he referred to it in his [50 reasons to oppose fluoridation](#) where Paul notes:

“ One very important study in China, which examined hip fractures in six Chinese villages, found what appears to be a dose-related increase in hip fracture as the concentration of fluoride rose from 1 ppm to 8 ppm (Li 2001) offering little comfort to those who drink a lot of fluoridated water. ”

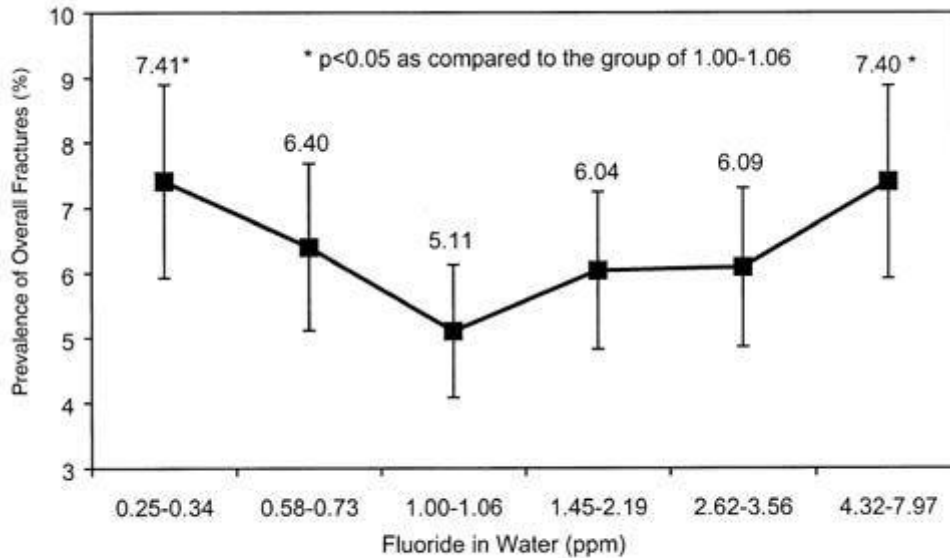


FIG. 2. Prevalence of overall fractures and fluoride concentration in drinking water in six Chinese populations since the age of 20 years.

Actually the study did not show what Paul claims – “a dose-related increase in hip fracture as the concentration of fluoride rose from 1 ppm to 8 ppm.” The particular data relates to **overall fractures**, and not hip fractures. And rather than demonstrating “a dose-related increase” it just shows a significant increase in the 4.32 – 7.97 ppm group when compared with the 1.00 a 1.06 ppm group.

But really he should have mentioned the significant increased incidence of fractures in the 0.25 – 0.34 ppm group (to the same incidence as at 8 ppm) as this is consistent with a beneficial role for fluoride at around 1 ppm. It demonstrates the negative effects of deficient intake of fluoride.

This brings us to the next issue – the selective approach to scientific literature and use of citations.

Approaching the literature – purposely or objectively

One thing that sticks out like a sore thumb when Paul and other opponents of fluoridation cite research papers is the predominance of studies from China and India. And the journal Fluoride, which is not considered a high quality journal by the scientific community, is often cited.

Just on the possibility of chance we might expect a better representation of countries of origin of the research, and of journals. I believe this demonstrates a selective approach to the literature.

If you wish to promote a pet theory or way-out idea it is possible to find a “scientific” citation to support it. All you need is Google and a fair bit of confirmation bias. The latter is a normal

problem for all of us – if we have a strong commitment to an idea we can usually find some handy citations to support it (and ignore those that don't). On top of that we can interpret those papers (or more likely just their titles or abstracts – who bothers to read the full text?) to fit in with our ideas.

It is just so easy to make any argument look “sciency” using citations these days. And who bothers checking them? A good proportion of readers seem to be convinced just by the presence of citations. (Or unimpressed by the lack of them – Paul described my last article as “*very, very short on science*” because “*surprisingly you gave no scientific citations at all.*”)

So citations do get thrown around a lot in this discussion – often in a meaningless and thoughtless way. As for their interpretation – in my articles *Fluoridation – are we dumping toxic metals into our water supplies?* and *Fluoridation – it does reduce tooth decay* I give examples from the local anti-fluoride activist web site FANNZ where cited sources are claimed to say the opposite of what they do say! (It always pays to check citations from ideologically motivated sources like this – I certainly do now).

Fortunately working scientists usually have the discipline of peer review and continual critique of their findings and idea by their scientific community. This encourages an ethos of objectivity and consideration of all the relevant literature – not just the cherry-picked stuff. Yes, this is difficult and never works perfectly but that discipline certainly helps.

An honest approach requires one to approach the scientific literature more objectively and intelligently than anti-fluoridation activists (or activists in general) do. A conscientious approach requires that readers critically assess studies, recognise problems and realise the need to get an overall picture – not a selected one.

I won't deal with the IQ issue, and attempts of fluoridation opponents to implicate fluoride in the “dumbing down” of the population, at this stage because Paul has indicated he will be covering it in a future article. But here are a few comments on the paper of [Xiang et al \(2003\)](#) which illustrates how Paul places a lot of confidence in a cherry-picked citation.

1. Why did the authors choose to publish in the journal “[Fluoride](#)?” It is certainly not considered of high quality. It is actually rather suspect because of the ideological commitment of the editors. This gives the impression that even suspect papers will be published if the story is right. My point is that if I had some credible findings in fluoride chemistry and wished to present a paper to the scientific community for their consideration Fluoride is the last journal I would choose.
2. If I was reviewing this paper for publication I would certainly call on the assistance of a skilled statistician as reviewer and would probably recommend changes as a result. I would ask the authors to clarify their figure 1 and its interpretation as well as explaining the meaning and significance of their “BMC” and “BMCL” and an estimation of the errors in their values.
3. Xiang's paper is a minor piece of evidence – surely it should be objectively considered together with all other publications in this area of research. The fact that it is taken in isolation (except for a few other low quality Chinese studies), and nothing of higher

quality or from different regions is considered, makes me suspicious. After all, a number of countries with highly qualified scientists (and activists claiming negative effects) have had many years to look at possible health effects from fluoridation. The fact that more credible papers are not produced is hardly good evidence for the claims made by anti-fluoride activists. Why would they rely on low quality research if better research supporting their claims was available?

Yet Paul uses Xiang's paper to authoritatively claim it had "*found a threshold at 1.9 ppm for this effect.*" (What effect he refers to is unclear.) How reliable is that figure of 1.9 ppm (actually 1.85 or 2.32 ppm F in the paper) – considering the huge variation in the data points of the Figure 1? (Unfortunately the paper is not a lot of use in explaining that figure – reviewers should have paid more attention.)

This is the problem. Papers are selected and then values are pulled out of them to make assertions or claims that really are not warranted – and certainly not by a balanced reading of the literature.

Disadvantaged children

Having experienced the reality of social disadvantage I am still cynical of many people who claim sympathy. Too often as a child I was blamed for problems I had no control over or told things would be OK when I knew they wouldn't. My experience showed me that most of those social workers, teachers and health practitioners just had no concept of the reality of my position. How could they – unless they had experienced it themselves.

Things are probably a lot better today – but I am still cynical of many of these assertions.

I feel the same cynicism and helplessness when opponents of fluoridation like Paul Connett agree on "*the need to help disadvantaged children*" - and then follow that declaration with arguments about hypothetical situations showing absolutely no idea of the reality of life for disadvantaged children.

Paul suggests my advocacy of fluoridation policies will trap families. "*What for example are parents in low-income families supposed to do if they don't want their children to drink fluoridated water?*" – he asks. Well, if he really cared – what about the children suffering horribly from toothache whose parents really don't have the luxury, the interest or feelings of choice, to think about the details of the water supply they use? It is the plight of those children which sparks my empathy.

Sure, there are a few disadvantaged or low-income families who face decisions involving priority of freedom of choice over social policy. The Catholic families who must find resources to send their children to fee-charging Catholic schools and not secular public schools. Or the religious fundamentalists who refuse to use public hospitals. These people do find the resources if their specific minority freedom of choice issue is really important enough to them. We don't deny the advantages of secular schools and public hospitals to the rest of society just because of the ideological foibles of a small minority.

The resources required to avoid a public water supply are much smaller and should not be used as an argument to deny the advantages of a social health policy to the rest of society.

Yes, children from disadvantaged backgrounds may well have problems with bad nutrition as well as poor oral health. **So let us help them.** Let us not deny them the beneficial effects of a well-established beneficial social oral health policy on the pretence that it might enhance issues related to poor nutrition. Let's not even worry about such a cynical diversion – why not do something about that poor nutrition instead?

I find the idea of refusing a beneficial social health policy to children because somebody has it in their head that it might enhance the problems of poor nutrition very cynical and anti-human. It shows a complete lack of empathy for socially and economically disadvantaged families and their children. It is an argument for standing by and doing nothing. And I am not impressed by Paul's reliance on reports from India where high natural levels of fluoride do present problems – a situation very different to those in New Zealand and the US considering the fluoridation issue.

Sorry if I come across harshly on this issue – it is important to me, raises strong feelings in me and I have seen too many examples of false concern and complete lack of empathy to suppress those feelings. I just think people who raise hypothetical “freedom of choice” issues to oppose beneficial social health policies really have no idea of what it is like for disadvantaged children and their families – or any empathy for their situation.

Nature and focus of debate

I think Paul and I have different concepts of what an exchange of scientific opinion should be like. We discussed this in our initial negotiations and our different approaches were obviously not resolved.

Paul expressed a wish that our exchange be focused on his own arguments, and indeed be limited to, and focused on, the issues raised in his book. I rejected this, arguing this was a discussion between equals. We each have our own points to make, our own data, experience and arguments, and we should do so. Anyway this is a public exchange with involvement of readers who are following the articles and commenting on the issues raised. We are really both aiming our arguments at our readers, not each other.

I do not think either of us should require that the other has one arm tied behind their back in entering an exchange like this. I certainly could not, in good faith, enter into such an “exchange” or “debate.”

Paul was kind enough to send me an electronic copy of his book – I thank him for this. I may review the book (which was highly recommended to me by a few local anti-fluoride activists) when I can find time. The book has also been useful for me in making specific criticisms of his arguments. But at no time have I agreed to limit my part of the exchange to the book.

I can appreciate Paul is proud of his book and therefore wishes to promote it. I can also understand why local opponents of fluoridation also promote the book. But he cannot legitimately demand that my part of the exchange be limited in the way he suggests. It is not my job to sell his book.

A general comment on the use of books in science. Books rarely get the degree of peer review of journal articles, can often be dominated by authors' biases or hobby horses, and are generally somewhat dated in their content. Hence researchers prefer citing research papers to books. Again, while it is understandable Paul should promote his book to health authorities and experts in NZ, surely he can appreciate that researchers might not give it the same authority they give research papers. Or have the same high opinion of the books the authors' naturally have.

In fact, along these lines, I understand that local researchers suggested that Paul submit his work on fluoride, or the reviews of others' research, to a reputable journal for peer review and publication. I understand he has not responded positively to that suggestion yet.

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Paul Connett - November 21, 2013

I am going to ignore most of the *personal* criticisms in Ken's response to my critique of his opening statement and focus largely on the science and scientific studies in question.

1. Different interpretations of the Li et al. (2001) paper

I am very familiar with the Li et al. (2001) paper on bone fractures in the elderly in six Chinese villages with fluoride concentrations in well water ranging from about 0.25 to 8 ppm. In fact, I reviewed a pre-publication copy of this paper sent to me by the lead author as part of my invited peer review of the York Report (McDonagh et al., 2000).

Had Ken taken advantage of my sending him the full pdf text of our book he would have quickly seen that the charge he levels at me of selectively using the Li et al (2001) text on bone fractures from China is grossly inaccurate.

Instead of relying on the misleading commentary of pro-fluoridation activist Kurt Ferre, he could have read Chapter 17 of our book (*The Case Against Fluoride*, CAF), where we covered *both* parts of Li's paper. The part Ken and Ferre cover, shows a U-shaped curve for all fractures combined. This shows a minimum for fracture rate at the village at 1 ppm. It could be argued – as Ken does – that at 1 ppm fluoride may confer some benefit in strengthening of elderly bones after a lifetime of exposure. However, such an argument is somewhat muted by the second part of Li's paper that deals with hip fractures, which is the most critical bone fracture for elderly people, since about half of the elderly never regain an independent existence after such a fracture. In this part of the study there is *no* U-shape – i.e. no apparent protection offered by fluoride against hip fracture – and the hip fracture prevalence appears to increase in a linear fashion above 1 ppm (actually maybe from 0.25 ppm).

This systematic increase becomes more apparent when one checks our *re-plot* of the data—see Figure 17.2 on p.179.

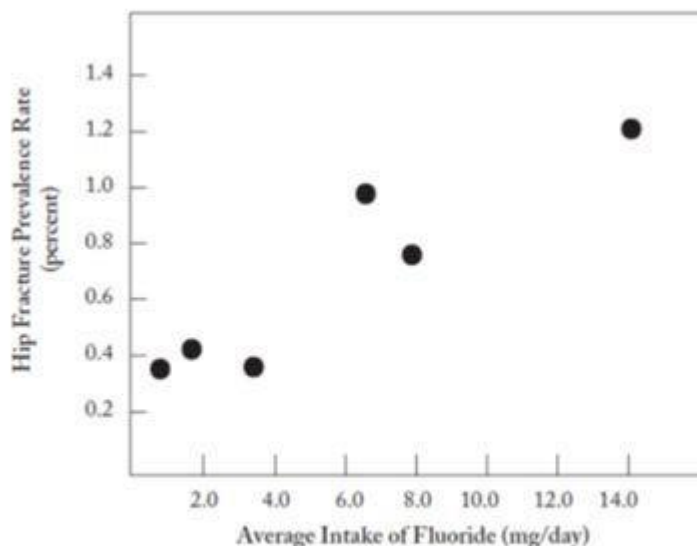


Figure 17.2. Prevalence of hip fractures (since the age of twenty years) plotted against average daily fluoride intakes in six Chinese populations; data from Li et al., summarized in table 17.2.²⁸

Please note I say *replot* because the graphs provided by Li et al (2001), including the one used by Ken, are not real plots at all. They are only illustrative. The points on the x-axis neither represent an average of the fluoride concentration in each village nor the estimated dose (mg/day) calculated by the authors, the six data points are simply evenly spaced out to illustrate which village is being represented for the fracture data on the y-axis. In the case of Figure 17.1 it makes little difference when one puts in the average dose in mg/day, but in the case of Figure 17.2 it makes a big difference and shows up this “apparent” linear trend more clearly.

While Ken is correct when he says that the only individual village to show a statistically significant increase in hip fractures is village 6, based on our replot the increases in villages 4 and 5 appear to be “real,” even though they are not statistically significant individually. In fact, the data for the whole set of villages appear consistent with a linear regression. Statistical significance is not the final word on whether a data point or data set is real or not. In our view, a linear increase in fracture rate for villages 3 through 6 (and maybe even villages 1-6) looks a more reasonable interpretation of the data than a *threshold* (i.e. a sudden tripling of the hip fracture rates) at village 6, the interpretation that Ken prefers.

It is unfortunate that Ken uses an inaccurate commentary from Ferre to mischaracterize what we did here.

2. Other studies of fluoride and the bone

However, there is a great deal of literature available on fluoride’s impact on the bone (see the references to Chapter 17, CAF). Ken will need more than the Li et al (2001) paper to establish that there is an overall benefit to the elderly bone when people are exposed for a lifetime to an approximate ten-fold increased exposure to fluoride via artificially fluoridated water. This is especially true for people with poor kidney function and high water drinkers

(miners in Western Australia drink between 10 and 12 liters of water a day). Can you provide more studies that support the possibility that fluoride protects the elderly bone Ken?

Nor is it just the bones of the elderly that is in question. I am still waiting to see Ken's response to the finding in the Schlesinger et al (1956) study of the second fluoridation trial (Newburgh-Kingston, NY, 1945-55) in which they reported a statistically significant increase in the prevalence of cortical bone defects (the ratio was about 2 to 1) in children in the fluoridated community versus the non-fluoridated community. The cortical bone is the outside lamellar structure of the bone whose integrity is important in resisting fractures. We discuss Schlesinger's work in CAF (p.96).

I am not aware of any health agency in any fluoridated country comparing fracture rates in children in fluoridated versus non-fluoridated communities or even examining fracture rates in children as a function of the severity of dental fluorosis. Scientists did this in Mexico (Alarcón-Herrera et al., 2001) and found an increase in fractures as the severity of dental fluorosis increased (see P.169, CAF). No attempt has been made to reproduce this result or conduct a similar study in any of the fluoridated countries.

3. Fluoride's topical action and saliva

As far as the mechanism of fluoride's topical mechanism on the teeth is concerned, Ken quotes the CDC from 2001,

" . . . drinking fluoridated water, brushing with fluoride toothpaste, or using other fluoride dental products can raise the concentration of fluoride in saliva present in the mouth 100-to 1,000-fold. The concentration returns to previous levels within 1–2 hours but, during this time, saliva serves as an important source of fluoride for concentration in plaque and for tooth remineralization."

I went back to this CDC Oral Health Division statement from 2001 and found the sentences that preceded Ken's quote most revealing. These preceding sentences read:

"Saliva is a major carrier of topical fluoride. The concentration of fluoride in ductal saliva, as it is secreted from salivary glands, is low – approximately 0.016 parts per million (ppm) in areas where drinking water is fluoridated and 0.006 ppm in nonfluoridated areas (27). This concentration of fluoride is not likely to affect cariogenic activity. However, drinking fluoridated water, brushing with fluoride toothpaste..."

These few sentences further strengthen Ken's arguments that it is fluoride delivered directly into the mouth that provides the saliva with concentrations, which may or may not do something and not, the meager concentrations reached systemically through the salivary gland, a position I erroneously attributed to him. My apologies.

As the CDC states the concentration of fluoride delivered by the saliva gland *"is not likely to affect cariogenic activity."* However, if it is the fluoride levels reached when fluoridated water has entered the mouth that is the key dynamic for fighting tooth decay, then I think this

weakens the need to force people to *drink* fluoridated water. Maybe we should be suggesting that people swish with fluoridated bottled-water and then spit it out! I also have to wonder why we are giving fluoridated water to babies before their teeth have erupted.

Let me ask for the *third* time how Ken feels about an alternative delivery system for fluoridated water. This would involve using fluoridated bottled-water in one-liter bottles at 0.7 – 1.2 ppm. These could be made freely available in dental offices (supermarkets, pharmacies or clinics). With this approach one could a) use pharmaceutical grade sodium fluoride; b) could control the dose and c) avoid not forcing it on people who don't want it. Nor does it involve giving up the central paradigm of the fluoridation program.

As far as the rest of the 2001 CDC quote is concerned I think the Oral Health Division is using a slight of hand here by mixing up a discussion of fluoride in food and water with *the fluoride in toothpaste*. That 100-1000 fold increase might take place when toothpaste containing 1000 or even 1500 ppm is used but is hardly likely with water at 0.7- 1.2 ppm.

I think the CDC put the “cat among the pigeons” among both fluoridation opponents and proponents when it admitted in 1999 that:

“Fluoride’s caries-preventive properties initially were attributed to changes in enamel during tooth development... However, laboratory and epidemiologic research suggest that fluoride prevents dental caries predominantly after eruption of the tooth into the mouth, and its actions primarily are topical...” (CDC, 1999).

It maybe that the CDC Oral Health Division in its 2001 paper was scrambling to salvage some kind of role for fluoridated water, sufficient to justify continuing its long-time support and promotion of the fluoridation program, despite its admission of the predominance of a topical effect. However, It would have been better if, in 1999, the CDC had changed the focus of its efforts from delivering fluoride systemically to delivering it topically, as well as addressing other key issues of diet, regular brushing and providing early interventions for children of low-income families.

In the latter respect I do not understand why Ken completely ignored the exciting news that I provided from unfluoridated Scotland, where they are having great success with teaching toothbrushing to infants as well providing better diets and earlier interventions.

As far as the mechanisms that Ken offers for a topical benefit derived from fluoridated water directly to the saliva in the mouth (and not via systemic exposure), he discussed “fluoride ions transferring from the water (or food) to saliva (and biofilms on the teeth).”

My experience when drinking water is that it hits the tongue, the back of the top front teeth and the palate before it swiftly goes down the gullet (unless it is deliberately swished). It seems to me that the fluoride ions have little opportunity to form a biofilm on any teeth other than the back of the front teeth. Nor is there much time to mix with the saliva. But this is only conjecture based on simple personal observations on my part and if Ken has a study that

shows the level of fluoride in the saliva is dramatically increased immediately after someone has swallowed a glass of water that would be very helpful.

4. The work of Xiang et al (2003) on IQ

Ken suggests that I am “cherry picking” the data by “singly pulling out the Xiang et al. study from 2003.” In actuality, I gave that as a specific example of a human study where effects were found at concentrations very close to the level at which we artificially fluoridate (0.7 to 1.2 ppm). This was in response to Ken’s claim that he was not impressed by all the high concentration animal studies that have found fluoride causes harm. I cited Xiang in the larger context of 37 (out of 46 human studies that have found an association between fluoride exposure and lowered IQ.) These studies come from India, Iran, Mexico and China, with the majority coming from China. 27 of them were reviewed by a Harvard team (Choi et al., 2012). Of these 27 studies 26 found a lowering of IQ (average of 7 IQ points). These results are remarkably consistent even though they have been performed in several different countries and many different parts of China. However, proponents of fluoridation have dismissed them on the basis that in two of these studies the range in the high fluoride village went up to 11.5 ppm. However, I pointed out that *nine* of the studies found a lowering of IQ *at or less than 3 ppm*, which offers no adequate margin of safety for a whole population drinking water in the range 0.7 to 1.2 ppm. So I wasn’t cherry picking here. We have to see Xiang’s work in the context of all these other studies as well as the other studies that show that fluoride is a neurotoxicant (discussed below). I chose Xiang’s study because it is one of the better studies. It controlled for more potential co-founders than others (including lead and iodine intake). Recently, Xiang has confirmed that as far as arsenic was concerned there were higher levels in the *low* fluoride village, so clearly arsenic was not a factor in the lower IQs found in the high fluoride village.

Yes, there are weaknesses in many of these IQ studies but the greatest “weakness” is the fact that countries that practice water fluoridation have made virtually no attempt to reproduce them or pursue the matter in any way. That is why, as Ken complains, I have not quoted studies from a wider range of countries: apart from a small early study in NZ (Shannon et al., 1986) and small behavioral study in the US (Warren et al., 1998) there aren’t any. At the very least these studies from China, India, Iran and Mexico represent a serious red flag on this practice and the health agencies in fluoridated countries are ignoring this red flag.

In his further attempt to downplay Xiang’s 2003 study Ken asks

“Why did the authors choose to publish in the journal “Fluoride?” It is certainly not considered of high quality. It is actually rather suspect because of the ideological commitment of the editors. This gives the impression that even suspect papers will be published if the story is right.”

I discuss these derogatory comments about *Fluoride* and its editors, and the double standard that Ken and other proponents of fluoridation exercise on this matter below, here I would like to discuss more about Xiang’s work.

5. Xiang and the journal *Environmental Health Perspectives*

Xiang almost certainly chose to publish in the journal *Fluoride* because it has probably given more coverage to the possibility that fluoride affects the brain of animals and lowers IQ in humans than any other journal in the world.

That being said if Ken is going to make judgments based on what journal the article appears in, then he might be interested by the fact that in 2010 Xiang et al submitted an updated version of their work to one of the leading environmental health journals, *Environmental Health Perspectives*, which is published by the National Institute of Environmental Health Sciences (NIEHS) a division of the National Institute of Health (NIH). After peer review this journal agreed to publish Xiang's work and posted a pre-publication copy on the internet (see Xiang et al., 2010).

However, Xiang was asked to withdraw his article for the *technical* reason that some of the material had already been published by this team (and that was the *Fluoride* article from 2003). But the key fact from the point of view of this discussion is that despite Ken's criticisms Xiang's work was peer-reviewed by this prestigious journal and was found acceptable for publication.

The update from Xiang was very important for this discussion and it is a pity that this was withheld from the mainstream scientific community. Xiang found that the lowering of IQ in his study correlated with the fluoride levels in the children's plasma. This greatly strengthens Xiang's finding by moving from a population (or ecological) study closer to a study based on individual exposure. Xiang finally published this part of his finding in *Fluoride* (Xiang et al., 2011).

Despite all of this, Ken considers Xiang's paper "a minor piece of evidence" and argues that,

"it should be objectively considered together with all other publications in this area of research. The fact that it is taken in isolation (except for a few other low quality Chinese studies), and nothing of higher quality or from different regions is considered, makes me suspicious. After all, a number of countries with highly qualified scientists (and activists claiming negative effects) have had many years to look at possible health effects from fluoridation. The fact that more credible papers are not produced is hardly good evidence for the claims made by anti-fluoride activists. Why would they rely on low quality research if better research supporting their claims was available?"

First of all, I argue that this study by Xiang is part of a large body of work that indicates that fluoride can damage the brain and I have summarized this large body of work previously (and it can be found at www.FluorideAlert.org/issues/health/brain)

So when Ken argues that "Papers are selected and then values are pulled out of them to make assertions or claims that really are not warranted – and certainly not by a balanced reading of the literature."

I must ask Ken what “balanced reading of the literature” on fluoride’s potential to damage the brain are you talking about? I have cited a large body of work and it *almost all goes in one direction*: fluoride is a potent neurotoxicant. Can you cite an extensive body of literature Ken that points in the opposite direction?

6. Fluoridated countries are not doing studies on key health concerns

Sadly, as I have already indicated the health agencies in those countries that support and promote fluoridation show absolutely no inclination to study their populations with respect to this effect, i.e. lowered IQ.

In fact the scientist who published one of the earliest animals studies on fluoride and animal behavior, Dr. Phyllis Mullenix, was fired after her paper was accepted for publication (Mullenix et al., 1995). Mullenix was the chairperson of the first toxicology department in any dental school in the US. She was hired specifically to look at the neurological effects of the chemicals used in dentistry. However, when she found changes in animal behavior related to fluoride exposure and published it, she was told that her work was “no longer relevant to dentistry.” I would argue that her work conflicted with dental establishment’s determination to continue the fluoridation program at all costs. The treatment meted out to Mullenix did not go unnoticed by members of the research community, who have treated doing research on fluoride like touching the third rail as far their careers were concerned.

In addition to their lack of interest in pursuing the lowering of IQ, neither health agencies nor those “highly qualified scientists” Ken talks about, have been inclined to fully investigate many other serious concerns such as lowered thyroid function, accumulation in the pineal gland (Luke 1997, 2001), arthritis rates in fluoridated populations, bone fractures in children (discussed above), earlier onset of puberty, behavioral problems in children and the plight of those who claim to be highly sensitive to fluoride’s toxicity.

All these concerns cry out for attention and certainly the attention of those critical of the epidemiology of studies conducted in those countries that are investigating some of these issues because they are legitimately concerned about what naturally fluoridated water is doing to their citizens. I have expressed my own thoughts on the reason for this lack of attention, but I would be interested in Ken’s thoughts on this overwhelming lack of scientific interest in investigating fluoridation’s potential health effects in the many years since the US Public Health Service endorsed fluoridation in 1950? Why in fluoridated countries are we getting an endless stream of studies on teeth but virtually none on other tissues in the body?

7. What other authorities are saying about fluoride as a neurotoxicant

Meanwhile, I am not the only scientist who is expressing concerns about fluoride’s neurological affects. According to the report by US National Research Council (NRC, 2006):

“A few epidemiologic studies of Chinese populations have reported IQ deficits in children exposed to fluoride at 2.5 to 4 mg/L in drinking water. Although the studies lacked sufficient detail for the committee to fully assess their quality and relevance to U.S. populations, the consistency of the results appears significant enough to warrant additional research on the effects of fluoride on intelligence.” p.8

(Note from PC: this comment was based on a review of only *five* of these IQ studies, there have now been 42.)

“On the basis of information largely derived from histological, chemical, and molecular studies, it is apparent that fluorides have the ability to interfere with the functions of the brain and the body by direct and indirect means.” p.222

“histopathological changes similar to those traditionally associated with Alzheimer’s disease in people have been seen in rats chronically exposed to AIF.” p.212

“Fluorides also increase the production of free radicals in the brain through several different biological pathways. These changes have a bearing on the possibility that fluorides act to increase the risk of developing Alzheimer’s disease.” p.222

“More research is needed to clarify fluoride’s biochemical effects on the brain.” p.222

“The possibility has been raised by the studies conducted in China that fluoride can lower intellectual abilities. Thus, studies of populations exposed to different concentrations of fluoride in drinking water should include measurements of reasoning ability, problem solving, IQ, and short- and long-term memory.” p.223

“Studies of populations exposed to different concentrations of fluoride should be undertaken to evaluate neurochemical changes that may be associated with dementia. Consideration should be given to assessing effects from chronic exposure, effects that might be delayed or occur late-in-life, and individual susceptibility.” p.223

EPA researchers listed fluoride among those chemicals for which there was “*substantial evidence of developmental neurotoxicity*” (W. Mundy et al.
<http://www.epa.gov/ncct/toxcast/files/summit/48P%20Mundy%20TDAS.pdf>)

The EPA headquarters scientists made this request to the U.S. Senate in 2000 (Hirzy 2000):

“We ask that you order an epidemiology study comparing children with dental fluorosis to those not displaying (fluoride) overdose during growth and development years for behavioral and other disorders.”

And according to Dr. Philippe Grandjean, one of the authors of the Choi et al (2012) study:

“Fluoride seems to fit in with lead, mercury, and other poisons that cause chemical brain drain. The effect of each toxicant may seem small, but the combined damage on a population scale can be serious, especially because the brain power of the next generation is crucial to all of us.” (Harvard Press Release)

As such it seems reckless to me – and many others – that we should knowingly increase the whole population’s exposure to this neurotoxicant by putting it into the public water supply.

Meanwhile, according to my son Michael Connett, who is the special project director at FAN, and compiled FAN’s Health Database, research on fluoride and the brain *in animals* has been rolling in at a steady pace over the past year — with over a dozen new studies, including some at notably low doses. One such study that is worthy to have on the radar is a study on *mice* by Liu et al, 2013. It reports that exposure to fluoride in drinking water (at 5 and 10 ppm) 4 weeks after weaning not only impaired cognition, but caused “anxiety- and depression-like behavior” as well. Here’s an excerpt from the discussion:

“Almost all existing epidemiological surveys on areas with high-fluoride drinking water have focused on cognition; however, our data suggest the need for a large-scale epidemiological survey to investigate whether drinking water with high levels of fluoride can lead to human emotional behavior changes. In summary, we found developmental fluoride exposure through drinking water 1) caused cognitive impairment and 2) led to anxiety- and depression-like behavior in adult mice. Therefore, consideration should be given to the neurotoxicity of fluoride used to combat dental caries, and attention should be paid to the concentration and dosage of fluoride, especially in young children. Our data suggest that excessive fluoride intake should be avoided to prevent its adverse effects.”

So the *weight of evidence* that fluoride impacts both the brain of animal and humans keeps piling up. About the only animal study that proponents can produce that has not found an effect is one performed by Whitford et al., 2009, who used behavioral tests on rats. They found no neurotoxic effects in their study setting. The study is limited because the rats were not dosed in utero or even during earliest post-natal development, but only after they had been weaned, which roughly translates to adolescence in rats.

Even if this had been a strong animal study, it is one of a small minority that found no evidence of neurotoxicity of fluoride. So, taking the scientific evidence on this topic as a whole, the *weight of evidence* from both animal and human studies is that fluoride is a developmental neurotoxicant.

8. The journal Fluoride and the ISFR

In his commentary on Xiang’s IQ paper Ken chose to do what a number of proponents of fluoridation do and that is to try and trash the journal *Fluoride*. He claims that *Fluoride* “is certainly not considered of high quality. It is actually rather suspect because of the ideological commitment of the editors.”

Why is it Ken you see proponents’ support of fluoridation as being “scientific” and opponents’ opposition to fluoridation as being “ideological”? Isn’t it possible that opponents of fluoridation are opposed for *scientific* reasons?

Fluoride is the only journal in the world, which is completely devoted to research on fluoride in many different areas of study (geological, biological, biochemical, toxicological,

epidemiological, medical and dental to name a few). To its discredit the US National Institute of Health (NIH) has refused to cover the contents of this journal in PubMed, thus depriving many researchers valuable information on fluoride's toxicity. This has been particularly true of depriving the mainstream medical community (many of whom use PubMed as their primary research tool) knowing about the extensive database indicating that fluoride is a neurotoxicant. It has done this despite covering the contents of far lesser journals and even trade magazines.

There have been three editors of *Fluoride* since it began its quarterly publication in 1968: Dr. George Waldbott, Dr. John Colquhoun and Dr. Albert Burgstahler (who passed away a few weeks ago). You would be correct in asserting that each of these editors was opposed to fluoridation, however that opposition was rooted in science not some ill-defined ideology. I think you can get a glimpse of the caliber of both Dr. George Waldbott and Professor Albert Burgstahler in the book they co-authored "Fluoridation: The Great Dilemma." (Coronado Press, Lawrence, Kansas, 1978).

I met Dr. John Colquhoun (briefly before he died in 1998) and videotaped an interview with him during my trip to NZ. I count this interview one of the great moments of my scientific career. Never have I been more impressed by someone's character than I was by John. He had been an avid promoter of fluoridation both as the chief dental officer of Auckland and as a city councillor. When during a world tour in 1980 (he went to Australia, Asia, North America and Europe) he found that talking behind the scenes to leading dental researchers that they were not finding much of difference between tooth decay in fluoridated and non-fluoridated communities and found the same in "confidential reports" from the NZ dental authorities on his return, he had the enormous courage and scientific integrity to come out publicly against water fluoridation and spent the rest of his life trying to right the wrong he had done. But while he was at the reins he never hesitated to allow pro-fluoridation voices and articles to be published in *Fluoride*.

I worked with professor Albert Burgstahler for many years and I can vouch for his scientific integrity. In fact for me he represented one of the pinnacles of scientific integrity and that is why FAN named an annual award in his name.

I never met Dr. Waldbott, but I know that his position was that neither the journal nor its supporting organization (the International Society for Fluoride Research, ISFR) should adopt a formal opposition to fluoridation (and its membership included both pro and anti-fluoridation scientists), but to publish as much science as they could on the subject – and as far as water fluoridation was concerned from both sides – and to let the chips fall where they may. He and his successors also believed that if the science was aired fully and openly it would lead most independent scientists to an anti-fluoridation position.

9. The double standard

Unfortunately, none of the dental journals have adopted the same openness on this issue. By and large they do not entertain any anti-fluoridation editorial or even a review that conflicts

with their mantra that fluoridation is “safe and effective.” So I think Ken is exercising a double standard here.

I should also point out that there have been several occasions where dental journals have gone out of their way to publish papers that have provided an “ideological” as opposed to a “scientific” support for one side of a controversial matter. Take the example of osteosarcoma. In 1991, shortly after the 1990 NTP animal study had found an association in male rats between fluoride exposure and osteosarcoma, the *Journal of the American Dental Association* (JADA) rushed to give prominence (i.e. the front cover was devoted to it) to an article, in which the authors clearly reveal their bias in favor of fluoridation. In this very small epidemiological study they proposed that far from causing osteosarcoma fluoride was actually protective against it (see P.187 in *The Case Against Fluoride, CAF*).

I think the following comments reveal a greater sensitivity to the need to protect the fluoridation program than protecting a few young boys from a life threatening disease:

“An incorrect inference implicating systemic fluoride carcinogenicity and its removal from our water systems would be detrimental to the oral health of most Americans, particularly those who cannot afford to pay for increasingly expensive restorative dental care . . . Because of its strengthening action, fluoride has been widely accepted as the responsible agent for the dramatic declines in the tooth decay rates of U.S. children and adolescents . . . A disruption in the delivery of fluoride through municipal water systems would increase decay rates over time . . . Linking of fluoride ingestion and cancer initiation could result in a large-scale defluoridation of municipal water systems under the Delaney clause. (McGuire et al., 1991, quoted on p. 187, CAF).

In my view the commentary (above) plus the JADA editors’ choice to give it this article full-front page coverage is an example of “ideology” not science at work. The authors and the journal both had a need to protect the fluoridation program at all costs – even if it meant downplaying the concerns about the fate of the young boys in question. I will pick up the osteosarcoma story again in a later submission.

10. A request to Ken

Finally, Ken I think it would save us all a lot of time if – putting the rhetoric and your general disdain for the opponents of fluoridation to one side – you would be kind enough to list the *primary studies that you have read* that have most convinced you that fluoridation is both safe for the bottle-fed baby and for the adult over lifelong exposure.

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Ken Perrott - November 25, 2013

It is a pity that Paul Connett chose to ignore the ethical question of balancing personal choice and social good because he took my comments on this as a personal criticism of him. They were not meant to be. I am happy to discuss the science but, in the end, science cannot make ethical and values decisions for us. Yes, it can, and should, inform those decisions – but pretending they are only about science does a disservice to science and to ethics.

Unfortunately science is often used in these sort of debates as a proxy for values issues. Professor Gluckman pointed that out in his statement *What is in the water?* An excellent article by Tania Ritchie in Science and Society outlines the dangers of this approach (see *The fluoridation debate: why we all lose when we pretend it's just about science*). She shows how using science as a proxy backs people into pseudoscientific corners (and that is certainly an issue for these opposing fluoridation). It also places an impossible demand of certainty on science (“*prove to me beyond doubt that fluoride at optimal concentrations is completely safe – if in doubt leave it out*”). And concentration on the science often disguises poor ethical positions. She concludes:

“Using good science to counter bad science is productive. Using good science to tell us what will happen if we make a certain decision is also, of course, vital. But pretending science can tell us what decision we should make, or trying to counter ethical concerns with science, will never be helpful.”

Well, for the moment I guess I am opting for “*using good science to counter bad science*” but I hope we can return to these ethical issues at some stage.

Nature of bioapatites and systemic role for fluoride

Paul seems not to have taken on board my description of the structural role of fluoride in apatites and the recognised beneficial role of ingested fluoride. (Perhaps he considered that section was somehow a personal criticism and should be ignored.)

Mind you, I keep coming across that problem with other anti-fluoride activists. They wish to talk only about topical application of fluoride, and ignore completely the beneficial effects of ingested fluoride. This seems to create reading, hearing and comprehension problems for them. So I get accused of advocating that suntan lotion should be drunk or similar attempts at humour!

However, it is a critical feature of this debate so I will just start this response by briefly repeating a few things.

$\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$ - Hydroxylapatite end member

$\text{Ca}_{10}(\text{PO}_4)_6(\text{OH},\text{F},\text{CO}_3)_2$ - The real world

$\text{Ca}_{10}(\text{PO}_4)_6(\text{F})_2$ - Fluorapatite end member

- Fluoride is a normal, natural component of bioapatites. In the real world these don't exist as end-member compounds such as hydroxylapatite or fluorapatite. They are more correctly described as hydroxyl-fluoro-carbonate-apatites.
- Accumulation of fluoride, together with calcium and phosphate, in our bioapatites is a normal part of development. This is beneficial because it helps strength our bones and teeth, and lowers their solubility.
- Both insufficient fluoride, or excess fluoride in our bioapatites can cause problems.
- Excessive dietary intake can result in excessive fluoride in our bones and teeth. Insufficient intake may also cause our bioapatites to be weaker and more prone to dissolve. When dietary intake of fluoride is reduced fluoride can be lost from bones and calcified tissues.
- The scientific literature reports that fluoride has a systemic role benefitting bones and pre-erupted teeth

Surface mechanisms for reducing tooth decay

We seem to be making a little progress here with the so-called “topical” mechanism – but only a little and very grudgingly. Paul has apologised for misrepresenting my explanation of the surface mechanism for the action of fluoridated water in countering tooth decay in existing teeth. He acknowledges that I was discussing the transfer of fluoride to saliva from water during drinking water, and not the smaller concentrations coming from the salivary glands after ingestion.

In this I was simply reporting what I have read in the scientific literature. But Paul will still have none of that. He concedes that fluoride in saliva “*may or may not do something*” and presents his own “*simple personal observations*” to claim that there is little chance of drinking water mixing with saliva. Not the first time I have heard this argument – and it always brings a picture to mind of a committed anti-fluoride activist drinking their water through a tube down the throat. I leave it to readers to observe their own drinking behaviour and decide if drinking water has little chance of mixing with saliva – or transferring ions to saliva.

So it is one step forward and another step back. Made worse by his assertion (from personal experience) “*that the fluoride ions have little opportunity to form a biofilm on any teeth other than the back of the front teeth.*” Of course the fluoride does not form a biofilm. It and other

ions in the water and saliva do, however, transfer to, and diffuse through, existing biofilms (plaque) on the teeth.

There are quite a few reports of the effect of regular consumption of fluoridated water increasing the F concentrations in saliva and plaque both after ingestion (e.g. [Cury & Tenuta 2008](#), [Martínez-Mier 2012](#)) and directly [Featherston 2000](#), [Bruun & Thylstrup 1984](#)). (Yes, I realise that the CDC states that the ingested fluoride delivered to saliva “*is not likely to affect cariogenic activity*” and this is echoed by other writers. However, there still seem to be workers who argue this does contribute and I am aware of laboratory experiments showing the mechanism can work at very low fluoride concentrations. But this is a detail I will leave to the experts – it doesn’t affect the current exchange).

Loaded language and scientific knowledge

Paul again refers to advances of scientific knowledge in a sneering way. He claims that the CDC “*admitted*” that research indicated the prevention of dental caries by fluoride occurs by a topical mechanism in existing teeth. He also speculates that the CDC “*was scrambling to salvage some kind of role for fluoridated water . . . Despite its admission of the predominance of the topical effect.*” Can somebody with research experience in chemistry really see scientific progress as some sort of winning-out over a conspiracy to ignore the “truth?”

Mary Byrne, a local anti-fluoridation spokesperson, shows a similar apparent misunderstanding of the nature of scientific knowledge when she describes, disparagingly, this progress in understanding as scientists being “*wrong for fifty years.*” She keeps repeating this even though her error has been explained to her.

These characterisations are like saying Newton was wrong with his laws of motion or that he was somehow hiding the truth and Einsteinian relativity is simply a case of scientists being forced to “admit”, or “concede” they were wrong – as if they had hidden something!

Use of loaded language like this has a political purpose which interferes with proper understanding of the science.

The journal *Fluoride*

Paul describes my comments about the journal *Fluoride*, and its editors, as “*derogatory,*” and accuses me of “*double standards.*” I think that shows a sensitivity and inability to consider my comments objectively. Not surprising, as Paul has some “irons in the fire” on this issue. I said that “*if I had some credible findings in fluoride chemistry and wished to present a paper to the scientific community for their consideration Fluoride is the last journal I would choose.*” This isn’t completely hypothetical because I have published a few papers on fluoride chemistry. So how do I decide where to publish my work?

Firstly, my fluoride work was relevant to pedology and soil chemistry so it was natural to consider soil science journals. This was the audience to aim for and our work was of direct

relevance to readers of those journals. I doubt that many of our intended audience or their institutes subscribed to, or read, *Fluoride*.

But, today if I were considering a **general** journal and had a look at *Fluoride* what would I find. First of all the website (where I would go to judge the journal's scope, requirements and refereeing policy) – seriously, does this show a credible scientific society or editorial office?



That extremely amateurish web page puts me off – perhaps there are other general journals dealing with fluoride (contrary to Paul's claim). Let us see if *Journal of Fluorine Chemistry* is better? See the difference?

Home page for the *Journal of Fluorine Chemistry*

Secondly, a quick skim of accepted papers in *Fluoride* indicates many are related to areas where fluoride toxicity is a problem because natural levels are high or excessive. The quality of many of these papers appears poor, a common problem where there are many authors whose main language is not English. It has a predominantly “third World” appearance. This would also raise a flag about possibly low standards of editorial review. Have a look at the [list of contents for one of the 2007 issues](#).

None of these factors would attract me as a working and publishing scientist concerned at establishing a publication record in high quality and credible journals.

However, if I was a non-English speaker with routine work which I might find difficulty publishing elsewhere, and especially if that work was related to areas where natural fluoride levels were high, I would probably consider the journal. With the realisation in the back of my mind that I would probably have no luck with submission to a more reputable journal.

Now, I am not being “*personal*” or “*derogatory*” in making that realistic evaluation. Nor do I think there are “*double standards*” in choosing a good journal for publication. Good work deserves a good journal for publication.

Paul effectively concedes this in referring to attempts by Xiang et al to get their work published in a more reputable journal. He laments the fact that this journal would not include material already published in *Fluoride* (standard procedure in the publishing world) as amounting to Xiang’s material being “*withheld from the mainstream scientific community.*” (Paul obviously agrees that *Fluoride* does not have a good standing in the mainstream scientific community). The lesson being that Xiang should have gone for the reputable journal first time around. Why publish in a journal which does not give access to “*the mainstream scientific community*” if one’s work is good enough to get published in a reputable journal

That is a sensible question – not a derogatory one.

Connett’s relation with *Fluoride*

It is instructive to look at Paul Connett’s own publications in *Fluoride*. He claims to have researched the issue for 17 years and I would expect that at least some of his research papers would have ended up in this journal.

A simple search for the name Connett showed me a couple of guest editorials – often co-authored with editors of the journal (see for example [*Professionals mobilize to end water fluoridation*](#) and [*Misplaced trust in official reports*](#)), a book review (co-authored with editors of the journal), reports of the International Fluoride Society (IFS – owner of *Fluoride*) conferences. There were abstracts of papers or posters presented at IFS conferences authored by Paul, Ellen and Michael Connett – but no sign of formal papers for these. (I hope Paul will correct me and provide links if I have missed papers with full text.)

This at least tells me that Paul is on excellent terms with those editing and running this journal. Not surprising when one looks at the names in the editorial board of the journal, the western contributors to the journal and the names on the advisory board of Paul's activist organisation Fluoride Alert.

Another thing that stands out for me about the editorial and advisory boards is the large number of retired, former, emeritus academics (around 17 from a glance). In the past I have also noticed this about the organisations and petitions of climate change climate contrarians/deniers/pseudosceptics. As a retired scientist myself I can appreciate how such issues can become hobbies, and avenues for social involvement and personal standing for people who formerly relied on their employment and professional standing for such things. I can also appreciate that retirement often also means loss of contact with current research and findings. This increases my suspicions of the journal and organisation.

There was one normal looking journal paper by Michael Connett "*Vulvar paget's disease: recovery without surgery following change to very low-fluoride spring and well water.*" My impression is this was simply an anecdotal history for one person – probably not normally acceptable in a scientific journal (unless at least written by the practicing medical person handling the case). A quick search of Google Scholar shows this to be Michael's sole scientific paper – perhaps not surprising as he is not a scientist. He is the Special Projects Director for the Fluoride action network, an attorney in Philadelphia, PA, and received his law degree from Temple Law School in 2011. But now has a scientific publication record!

(Note for non-scientists wishing to show a scientific publication record. There are plenty of anecdotal stories on the internet by people claiming sensitivity to fluoride. Hell, the other day I read the personal account of one person with skeletal fluorosis which cleared up immediately he stopped drinking tap water! You could select your own "case history," write it up as a scientific paper and submit to *Fluoride*. Mind you, your paper might not be all that visible to the "mainstream scientific community").

Looking at *Fluoride*, Fluoride Alert and the International Society for Fluoride Research I get a strong impression of a group who take in each other's laundry – but at the same time give publication space for some third world scientists who may not meet the standards of more reputable journals.

Paul gave it away when he reported to us that "*the US National Institute of Health (NIH) has refused to cover the contents of this journal in PubMed.*" Surely that tells us something about how this journal is considered by the science community (and please – if one has to resort to conspiracy theories to explain this the argument is surely already lost.)

Bones, hip fractures and the literature

Kurt Ferre's comment about misrepresentation of the Li et al (2001) paper referred to Paul's note on it in Fluoride Alert (Reason 29 of *50 reasons to oppose fluoridation*). Here Paul did describe the data as relating to hip fractures and not over all fractures. OK, Paul in chapter 17

of his book may have been more specific but that is not what Kurt referred to. (By the way, I am still plodding through Paul's book – on chapter 9 at the moment).

Paul claims I “prefer” an “interpretation” of the Li et al (2001) paper that there is a “sudden” appearance of hip fracture at a higher concentration rather than a linear increase from low concentrations. He is wrong – I don't prefer any specific interpretation. I was merely pointing out what can be drawn from the statistical analysis of the data.

One of our commenters has already noted that Paul's argument for his own interpretation of the data here amounts to special pleading – where he has to ignore, or denigrate, the statistical analysis. He is pleading when he writes that increases “appear to be ‘real’ even though they are not statistically significant individually.” Or that the data “appear consistent with a linear regression. Statistical significance is not the final word on whether a data point or data set is real or not.”

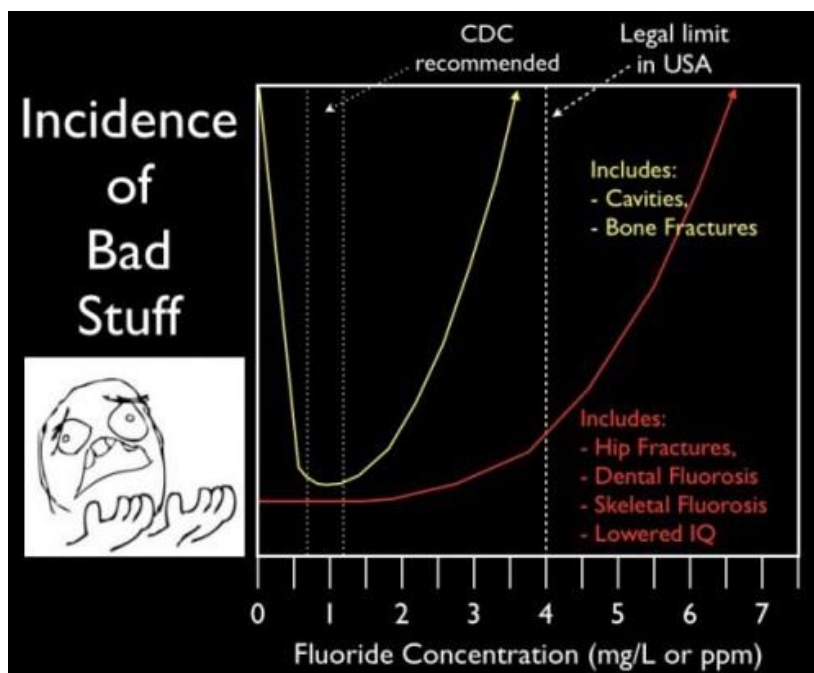
These were the sort of statements I would put red lines through when I was reviewing papers submitted for publication.

However, this is a digression. The interpretation of the increase at higher concentrations is not important. The fact is neither overall fractures or hip fractures showed an increase at fluoride concentrations considered optimum for oral health.

It was clear to me when I originally read and wrote about Li et al's (2001) paper (see - *Is fluoride an essential dietary mineral?*) that the increased incidence of overall fractures at concentrations below optimum did not refer to hip fractures. The authors specifically brought that to readers attention - “the data show a somewhat different pattern for hip fractures in relation to the water fluoride levels. . . Instead, the prevalence of hip fractures was stable until the water concentration reached 1.45–2.19 ppm.” They qualified this with “However, it may not be appropriate to conclude that the risk of hip fracture is more sensitive to the water fluoride concentration as compared with overall fractures, because the number of hip fractures in the present study is relatively small.” And they did conclude that “our results on hip fractures support previous findings that fluoride around 1 ppm in drinking water does not increase the risk of hip fracture.”

This diagram by Ethan Seigel (which I reproduced in an article earlier this year (see *Getting a grip on the science behind claims about fluoridation*) was clearly taking on board Li et al's work – when perhaps it should not have been so specific.

But of course the issue of hip fractures does not rest with the work of Li et al alone. I wrote about this specifically in *Fluoridation: the hip fracture deception* where I also mentioned the recent paper of Näsman et al (2013) “*Estimated Drinking Water Fluoride Exposure and Risk of Hip Fracture: A Cohort Study*” showing no significant correlation of hip fractures with fluoride in drinking water at the optimum concentrations.



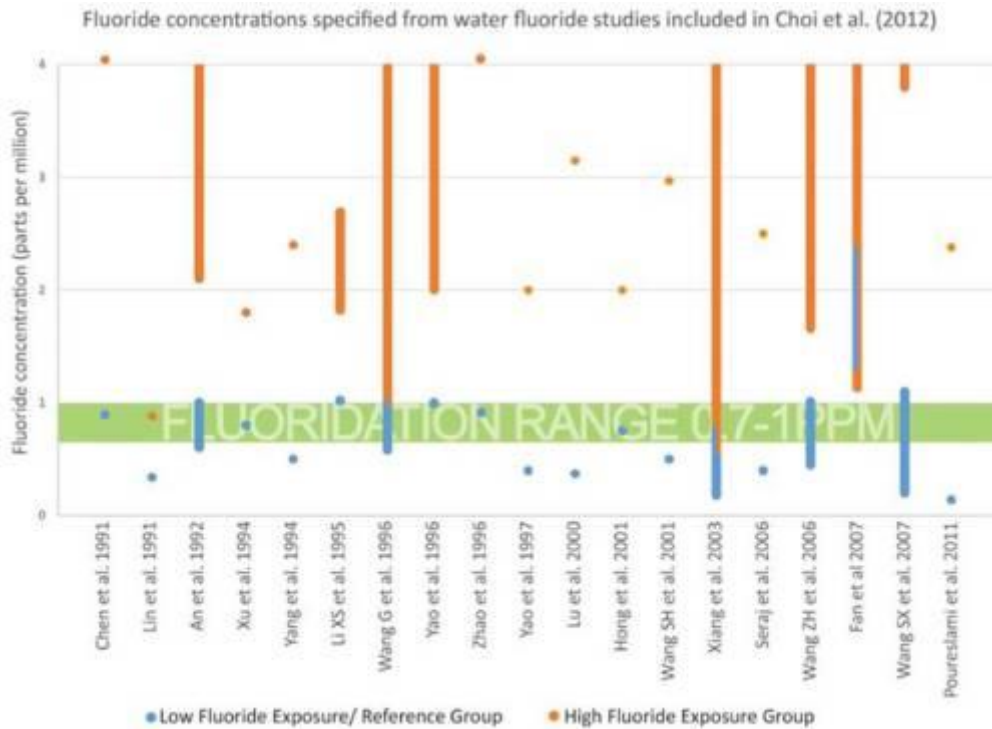
Miscellaneous

Delivery systems: It seems I must respond to Paul's suggestion of "*an alternative delivery system for fluoridated water*" – selling fluoridated bottled water. I guess that already happens in many places but I did not take his suggestion seriously because he is offering it as a substitute for already existing social health policies. That is not my area of expertise but I can understand how fluoridated water and fluoridated salt are effective as social policies for overcoming problems where the natural fluoride levels are deficient. Surely bottled water in the corner of a "supermarket, pharmacy or clinic" hardly measures up as a social health policy? Fluoridated salt seems to me to be a more credible alternative to water fluoridation.

Having said that, bottled water is culturally preferred in some countries and is attractive to some age groups in others. There are suggestions, therefore, that fluoridation of bottled water should be encouraged. New Zealand and Australia recently brought in regulations allowing this.


Inference from high concentrations: Paul has objected to my criticism that he often relies on extrapolation from laboratory or epidemiological studies where higher than optimum fluoride concentrations were used. He responded by discussing Xiang et al (2003) and argued that some of the studies covered by Choi et al (2012) did include lower concentrations.

However, there is still a tendency to then fall back on all the studies to give extra weight to his assertions, rather than just rely on the low concentration studies. I think the image below prepared by fellow New Zealander [Andrew Sparrow](#) helps put this issue into context. High fluoride cases in Choi et al (2012) were almost all completely out of the zone for optimum fluoridation of drinking water.



Appeal to authority with declarations: This tactic is used a lot by anti-fluoride activists. The poster below is a recent example from Fluoride Free NZ. The inclusion of a citation gives it some authority – but can anyone find that paper? No one at Fluoride free could – yet they were promoting a claim using the citation!

DID YOU KNOW THAT IT HAS BEEN
MEDICALLY DOCUMENTED
IN DOUBLE BLIND CLINICAL STUDIES
THAT EXPOSURE TO
FLUORIDE
CAN CAUSE
ECZEMA IN CHILDREN AND ADULTS



Journal of Dental Medicine (Volume 16. No 4. October 1961)

The Journal of Dental Medicine is now defunct and I could find no abstracts or full text on the internet. However, I did find a [description at http://slweb.org](http://slweb.org) - a well-known anti-fluoride activist site. This claimed adverse reactions, affecting *“the dermatologic, gastro-intestinal and neurological systems,”* to fluoride in 1% of the group studied! I would have liked to check out the statistical analysis used in the study as this seems a very small response. Was 1% significantly different to zero in this study?

What the hell – Fluoride Free NZ doesn't care. They went ahead with a poster and its promotion anyway. As a political activist group they are concerned more with moulding public opinion than the facts.

Paul might argue this case is a diversion he is not responsible for. But my point is that activists do this sort of thing all the time. And Paul is no different with the way he quotes from the NRC (2006) report in his section **“7. What other authorities are saying about fluoride as a neurotoxicant.”**

He quotes phrases like:

- *“the results appears significant enough to warrant additional research on the effects of fluoride on intelligence.”*
- *“These changes have a bearing on the possibility that fluorides act to increase the risk”*
- *“More research is needed to clarify fluoride’s biochemical effects on the brain.”*
- *“studies of populations exposed to different concentrations of fluoride in drinking water should include “*
- *“Studies of populations exposed to different concentrations of fluoride should be undertaken”*

“Consideration should be given to assessing.”

The point is one can agree with all these suggestions for ongoing and future research and still accept the current assessment that fluoridation is safe. Just because there is a logical possibility of a suggested danger does not, in itself, make that danger real.

This ongoing research is happening and health authorities do monitor current research findings. In New Zealand the Ministry of Health set up the National Fluoride Information Service to do this specific job and it regularly reports current research findings. Similarly, a report from the NZ Parliamentary health committee just the other day recommended:

“the Government work with the Ministry of Health to ensure that the addition of fluoride to the drinking water supply is backed by strong scientific evidence and that ongoing monitoring of the scientific evidence is undertaken by, or for, the Ministry of Health, and that the Director-General of Health is required to report periodically to the Minister of Health on the status of the evidence and coverage of community water fluoridation.” (see From dental neglect to child abuse?).

It is irresponsible to use such urgings to continue research as some sort of proof that there are problems sufficiently big enough to warrant abandoning a social health policy known to help people. Or to call that social health policy “reckless,” as Paul does.

Paul Connett does the same thing with the paper by Xiang et al (2003) and other Chinese work in the area of IQ. He acknowledges himself that "there are weaknesses in many of these IQ studies." These weakness and the speculative nature of his conclusions do not stop him from seriously claiming that there is a very low limit of sensitivity to fluoride effects on IQ. I repeat my question from my last article about the huge variability in the data and how the hell one can place any confidence on the result drawn from Xiang's figure.

“Yet Paul uses Xiang’s paper to authoritatively claim it had “found a threshold at 1.9 ppm for this effect.” (What effect he refers to is unclear.) How reliable is that figure of 1.9 ppm (actually 1.85 or 2.32 ppm F in the paper) – considering the huge variation in the data points of the Figure 1? (Unfortunately the paper is not a lot of use in explaining that figure – reviewers should have paid more attention.)”

The final request: Paul wants me “to list the primary studies that you have read which most convinced you that fluoridation is both safe for the bottle-fed baby and for the adult over lifelong exposure.” In thinking about this I have concluded it is a strange request because I don't think creative scientists think that mechanically.

My concepts and ideas derive from multiple sources – I never put my eggs all in one basket as it were. I can find I am impressed by something in a paper which also has something which doesn't impress me. Consequently I take what I can from wherever I can and try to critically understand what I read.

It's a bit like that with people. You have to accept them warts and all and avoid the immaturity of placing anyone on a pedestal – a sure way to later find they have feet of clay.

So unfortunately I cannot satisfy Paul's request. He will have to deal with the actual arguments I put forward.

As for the issue of bottle-fed babies – I am sure this will come up at some stage. It already has in the comments discussion.

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Paul Connett - December 2, 2013

When is Ken going to present his case for fluoridation?

In his thread Ken has had three opportunities to present the *Case for Fluoridation*, but he seems to be content to nibble around the edges. His stating over and over again that the fluoride ion is a natural constituent of apatites doesn't get us very far. I was expecting by now that Ken would have tackled three basic questions head on:

- 1) Is it Ethical?
- 2) Is it Effective?
- 3) Is it Safe?

The ethics

I was expecting the ethical case to be tackled with rigor, but Ken quickly dismissed the central question of whether fluoridation was medical treatment as simply a matter of semantics. Clearly, if fluoridation is medical treatment or even simply human treatment, it violates the individual's right to informed consent for such treatment. So simply declaring this to be a matter of semantics dodges a very important issue – and for many opponents of fluoridation the central issue.

So let me ask Ken if he will accept this two-part definition of a medicinal product from the European Union Directive 2004/27/EC:

Medicinal product:

(a) Any substance or combination of substances presented as having properties for treating or preventing disease in human beings; or

(b) Any substance or combination of substances which may be used in or administered to human beings either with a view to restoring, correcting or modifying physiological functions by exerting a pharmacological, immunological or metabolic action, or to making a medical diagnosis.

No RCTs after 68 years

As for the second and third questions I was expecting Ken to layout the scientific studies that had convinced him that fluoridation was both safe and effective. Ideally, one would have wanted him to give a link to a randomized controlled trial (RCT) establishing the effectiveness and assessing the safety of this practice. This after all is the gold standard for such matters. **However, after 68 years of this practice this has not been attempted.**

Failing an RCT one would have wanted to see Ken identify the best quality studies that have convinced him that the practice he advocates and defends actually works to a meaningful extent against a background of other sources of fluoride, and does not present any dangers – especially to those he particularly wants to help, children from low-income families.

Moreover, since this is a practice being forced on millions of people – and in thousands of cases against their expressed opposition – one has the right to anticipate that proponents would be able produce the highest quality studies that *overwhelmingly* demonstrate their case. With a forced measure like this, one would have anticipated little room for any doubt about whether it worked or not, and by which mechanism it worked. Moreover, should harm be demonstrated at some higher dose level, one would have anticipated that proponents would be able show that the *margin of safety* would be so high that the even the most vulnerable individuals in society would be protected no matter how much water they drank and no matter how much fluoride they got from other sources.

So where is this overwhelming evidence of effectiveness and safety Ken?

Ken has ducked key discussions and questions

So far Ken has provided little evidence to demonstrate any of the above reasonable expectations for such a practice. He has even ducked key discussions on the difference between concentration (mg/liter), dose (mg/day) and dosage (mg/kg/day). Comparisons based only on concentrations – and not on dose or dosage – such as used by Siegal and Sparrow in their respective diagrams, are seriously limited if not meaningless. Nor has he addressed even the *need* for a *margin of safety analysis* when harm has been found at high doses. Ken does not deny that harm (e.g. hip fractures and lowered IQ) has been found only that the *concentration* (ignoring the issue of dose) was too high to be of significance

This refusal to lay out his case in comprehensive scientific terms was most clearly revealed in his response to two things I asked for in my last posting:

- a) *Where is the body of scientific evidence that indicates that fluoride is not a neurotoxicant?*
- b) *Provide a list of primary studies that have most convinced him that fluoridation is safe for the bottle-fed infant and lifelong exposure for the adult.*

As far as a) is concerned, I offered a large body of evidence that fluoride was a neurotoxicant:

Over 40 animal studies show that prolonged exposure to fluoride can damage the brain.

19 animal studies report that mice or rats ingesting fluoride have an impaired capacity to learn and remember.

12 studies (7 human, 5 animal) link fluoride with neurobehavioral deficits

3 human studies link fluoride exposure with impaired fetal brain development

37 out of 43 published studies show that fluoride lowers IQ, of which 27 were part of a meta-analysis conducted by a team from Harvard (Choi et al.)
(www.fluoridealert.org/issues/health/brain)

Contrary to arguments by proponents the vast majority of these IQ studies were carried out at concentrations which offered little or no margin of safety to protect *all children* in a large population drinking uncontrolled amounts of fluoridated water and getting fluoride from several other sources, including sources unlikely to be available to many of the children in these studies (e.g. fluoridated toothpaste and bottle-feeding with formula made up with fluoridated tap water). Up to 10 of the studies in the Choi analysis had levels in the high fluoride village of 3 ppm or less.

So that was the weight of evidence on my side of the pan scale, it is only after seeing what Ken can put in the pan on his side of the scale that independent observers can make a scientific judgment on the true weight of evidence (see more below). Only then can we know if it is wise to ignore the many red flags being waved on this issue.

But Ken ignored this reasonable request preferring instead to rehash his criticisms of just Xiang's work.

The need for a weight of evidence approach

What we need here – not only on neurological effects but for all the health concerns – is a *weight of evidence* approach. In this approach the quality, quantity, and relevance of *all* available evidence should be weighed and balanced (synthesized) to arrive at a conclusion. For the question of fluoridation, some of that evidence comes from animal experiments, some from epidemiological studies, some should come from RCTs on effectiveness (which amazingly -as indicated above – don't exist for fluoride), some from medical case reports, some from basic biological/chemical/physical knowledge, and some from ethical considerations. This is what the National Research Council did in its 2006 report (except the NRC didn't examine the ethical issues), and what we tried to do in our book and what I had hoped Ken would have attempted in presenting his *Case For Fluoridation*.

As far as b) is concerned, this was Ken's reply:

Paul wants me "to list the primary studies that you have read which most convinced you that fluoridation is both safe for the bottle-fed baby and for the adult over lifelong exposure." In thinking about this I have concluded it is a strange request because I don't think creative scientists think that mechanically.

My concepts and ideas derive from multiple sources – I never put my eggs all in one basket as it were. I can find I am impressed by something in a paper which also has something which doesn't impress me. Consequently I take what I can from wherever I can and try to critically understand what I read.

It's a bit like that with people. You have to accept them warts and all and avoid the immaturity of placing anyone on a pedestal – a sure way to later find they have feet of clay.

So unfortunately I cannot satisfy Paul's request. He will have to deal with the actual arguments I put forward.

I am sorry Ken, I don't mean to be rude but I find this response a total waffle. If you have the science to support the safety of fluoridation – and can discount many of the health concerns that I and others have raised – then you should be able to present that case using primary health studies, and preferably primary health studies carried out in NZ. You should then be able to buttress that with all the other scientific information available and then apply a *weight of evidence* analysis as discussed above. After all it is a practice you want to see imposed on others; as such it is your case to win. If you can't do that then your support of water fluoridation is highly suspect and amounts to little more than posturing. So I would like to tighten up this discussion and ask you some very specific questions.

A few very specific questions pertaining to health concerns

At the outset, before I lay out these questions, I have to acknowledge the fact that in some respects this is not a level playing field for opponents and proponents of fluoridation. It may appear that I am demanding too much from Ken. I admit that the matter is intrinsically unfair. For a critic of fluoridation it is only necessary to produce one ugly fact – one health concern that has not been resolved – to put the practice into question. I can produce several.

On the other hand a proponent of a measure that is being forced on millions of people should be on top of every health concern. A proponent should be able to demonstrate (or at least feel satisfied) that *every* health concern has been addressed in such a way (i.e. via careful study) so as to leave no residual concerns. It is tough burden but is the nature of the beast when proposing or supporting a health measure that is forced on millions of people.

The shocking fact is that many health questions were unresolved when fluoridation was launched in 1945 and endorsed by the US Public Health Service in 1950 (see chapters 9 and 10 in *The Case Against Fluoride...*).

There are many health concerns that have not been carefully studied

I am afraid that the sad truth is that there are many serious health concerns with respect to swallowing fluoride and lifelong exposure to fluoridated water and other sources in our daily lives that have simply not been carefully studied in fluoridated countries and thus still unresolved. The York Review (McDonagh et al., 2000) reached this conclusion in 2000, as did the chairman, John Doull, of the NRC (2006) review. In an interview in *Scientific American* (Jan, 2008), the NRC chairman was quoted as saying:

“What the committee found is that we've gone with the status quo regarding fluoride for many years—for too long really—and now we need to take a fresh look . . . In the scientific community people tend to think this is settled. I mean, when the U.S. surgeon general comes

out and says this is one of the top 10 greatest achievements of the 20th century, that's a hard hurdle to get over. But when we looked at the studies that have been done, we found that many of these questions are unsettled and we have much less information than we should, considering how long this [fluoridation] has been going on." (Fagin, 2008).

Doubtless Ken will point out that Doull has since made a statement supporting water fluoridation, which has been circulated by proponents. However, his own personal opinion of water fluoridation does not diminish in any way his comments on the poor quality of the research on this matter. **What is even more distressing is that since the NRC (2006) report was published practically none of the research recommended by the committee has been carried out.**

Ken will find out for himself how poorly fluoridated countries – especially New Zealand – have investigated the health concerns pertaining to fluoridation, if he opens his parachute and seeks answers to the very specific questions I have listed below.

My specific questions for Ken pertaining to health concerns

- 1) Can you find studies that have convinced you that lifelong exposure to fluoridated water and other daily sources of fluoride (i.e. total daily dose of fluoride) is not increasing the risk of arthritis or **arthritic-like symptoms**, which have been identified as being the first symptoms of fluoride toxicity in research on skeletal fluorosis (see, e.g., Boillat 1980; Czerwinski 1988; Hileman 1988). These symptoms occur long before we reach bone levels that cause crippling skeletal fluorosis, the only end point considered by the US EPA when they determined the safe drinking water standard for fluoride in 1986 (i.e. 4 ppm).
- 2) Repeating two earlier requests, can you produce the studies that have convinced you that long term exposure to fluoridated water and other common sources of fluoride causes no damage to individuals with **impaired kidney function**?
- 3) Can you find studies that have convinced you that exposure to fluoridated water and other daily sources of fluoride (i.e. total daily dose of fluoride) is not increasing the risk of **lowered thyroid function**, including among those with suboptimal iodine intake (Galletti and Joyet, 1958; Lin 1991). This is an especially relevant question in light of the increase in iodine deficiency seen in the U.S. and other western nations over the past 30 years, as well as the large increases in the incidence of hypothyroidism. Lowered thyroid function would be one explanation for lowered IQ and would also explain the delayed eruption of the teeth for which there is some evidence.
- 4) Can you find any study that has refuted the *key finding* by Bassin et al., 2006, that there appears to be an *age-specific nature to the risk* of boys developing **osteosarcoma** when exposed to fluoride? In a matched case-control study Bassin found that boys exposed to fluoridated water in their 6th to 8th years had a 5-7 fold increased risk of succumbing to osteosarcoma by the age of 20. Note: The much-anticipated study by Bassin's thesis advisor

Chester Douglass (Kim et al, 2011) failed to address Bassin's central thesis concerning the age-specific nature of the risk *despite prior claims that it would* (Joshipura and Douglass, 2006)

5) Can you find any attempt by any health agency in any fluoridated country to investigate in a scientific manner a) the many anecdotal reports, b) case studies by Waldbott, 1955; Shea et al., 1967; Grimbergen, 1974; Petraborg, 1974, 1977; and c) a clinical trial by Feltman, 1956 and Feltman and Kosel, 1961, that suggest that **some individuals (may be 1% of the population) are very sensitive to low levels of fluoride exposure (e.g. 1 mg per day)?**

These individuals report experiencing a variety of symptoms that are reversed when the source of fluoride is removed and reappear when the fluoride is introduced. Please note: The Australian National Health and Medical Research Council recommended such scientific studies be carried out in 1991 (NHMRC, 1991), but not one has been carried out in the 22 years since this recommendation was made. See more discussion on this topic in chapter 13 of our book and in Spittle (2008).

6) Can you find any attempt by any health agency in any fluoridated country to follow up the finding by Schlesinger et al, 1956 in the Newburg-Kingston, NY fluoridation trial, that the young girls in the fluoridated community were **menstruating on average 5 months earlier** than the young girls in the non-fluoridated community?

7) Repeating an earlier request discussed above, can you provide a list of animal and human studies that nullify the weight of evidence I have listed above that indicate that fluoride is a neurotoxicant with an *inadequate margin of safety* to protect *all* children (including those with nutrient deficiencies) drinking uncontrolled amounts of fluoridated water in addition to fluoride ingested from other sources?

8) Can you point to any studies conducted in fluoridated countries that have convinced you that exposing babies to fluoridated water causes no other damage to their developing tissues other than the damage to their growing tooth cells leading to dental fluorosis? Or is this just wishful thinking on the part of proponents? **Is it likely that the fluoride ion would confine its biochemical interference only to the growing tooth cells?** What about bone cells? Brain cells? Thyroid gland cells?

9) Can you find any study carried out in NZ or any other fluoridated country that has set out to assess total exposure to fluoride by **monitoring fluoride levels in bones** at either biopsy during operations or at autopsy? Note: this was another suggestion made by the Australian NHMRC in 1991 but was never pursued by any Australian health agency.

10) What **studies carried out in NZ** have investigated *any* health concerns in fluoridated communities? I couldn't find many can you? Would you agree that the absence of study is not the same as absence of harm?

The evidence of fluoridation's effectiveness is weak

Similarly, we need to tighten up the discussion of fluoridation's effectiveness. A scientific proponent like Ken should be able to present the primary scientific studies and *weight of evidence* analysis that has convinced him that drinking fluoridated water leads to a *significant* reduction in tooth decay. Being able to offer a theoretical mechanism of action (and I discuss some of Ken's ideas on this below) is only part of the requirement.

In chapters 6-8 of our book we present the case that the evidence that swallowing fluoride or drinking fluoridated water reduces tooth decay by a significant amount – is very weak – especially in the permanent teeth. This is especially apparent in the larger studies like the US National Institute of Dental Research (NIDR) study reported by Brunelle and Carlos in 1990 (this incidentally was the largest survey of tooth decay ever carried out in the US). The authors looked at 39,000 children in 84 communities and reported an average saving in tooth decay for 5 to 17-year-olds of just 0.6 of one *permanent* tooth surface (see Table 6). This meager saving of 0.6 of one tooth surface out of over 100 permanent tooth surfaces in a child's mouth was not even shown by the authors to be statistically significant. I think for most people such a benefit – even if it was real – would be of an insufficient magnitude to justify forcing the practice on people or taking the many health risks involved, especially the possibility that we may be lowering the IQ of some of our children.

So where are the comparable studies that Ken has read that offset the Brunelle and Carlos study and the other studies and reviews that we cite in chapters 6-8 (Ziegelbecker, 1981, 1993; Leverett, 1982; Colquhoun, 1984, 1986, 1987, 1990, 1992, 1995 and 1997; Diesendorf, 1986; Colquhoun and Mann, 1986; Gray, 1987; Yiamouyiannis, 1990; Steelink, 1992; Teotia and Teotia, 1994; Spencer et al., 1996; de Liefde, 1998; Kumar et al., 1998; Colquhoun and Wilson, 1999; Locker, 1999; McDonagh et al, 2000; Kumar et al., 2005; Komárek et al, 2005; Cheng et al., 2007; Pizzo et al., 2007; Osmunson, 2007 and Warren et al., 2009).

To these studies we must add in a *weight of evidence* approach two other facts: 1) several modern studies have not found tooth decay to increase when fluoridation has been stopped in various communities in Finland, former East Germany, Cuba and British Columbia, Canada and 2) the many press reports from major cities in the US of a dental crisis in low-income areas even though they have been fluoridated for over 20 years (for citations see Chapter 8 in *The Case Against Fluoride...*).

Again what we are looking for here is a presentation of the evidence by Ken that would persuade an independent observer that the *weight of evidence* for effectiveness is very strong and outweighs the evidence of little benefit presented in the studies cited above.

Ken's topical mechanism via saliva and plaque

As with other proponents of fluoridation, Ken asserts that fluoridated water works topically, by increasing the level of fluoride in saliva and plaque. There is scarce data, however, to support this claim. Ken cites four papers (only one of which is a primary study), but as I discuss below, these papers do little to answer the key questions: namely: (1) are the saliva and plaque F levels produced by fluoridation high enough and of sufficient duration to

prevent caries, and, if so, (2) are the differences in saliva and plaque F levels between children in fluoridated and non-fluoridated communities of sufficient magnitude to produce a meaningful difference in caries?

There is scarce data in the four papers Ken cites (Cury & Tenuta 2008, Martínez-Mier 2012; Featherstone 1999, Bruun & Thylstrup 1984). Of the papers, only Bruun & Thylstrup 1984 is an actual study, and it deals with a high-fluoride community (2.31 ppm), and thus, were it a study on adverse health effects, I suspect Ken might claim it irrelevant to fluoridation. But, assuming it is relevant, it's worth noting that – although the authors found a lower caries rate in the high-F community (vs a community with 0.36 ppm) — the authors note that their **"analyses relating the individual fluoride concentrations in whole saliva to the clinical caries scores within each of the two areas indicated that no causal relationships seem to exist between these two parameters."** So, while the authors conclude that “frequently increased availability of fluoride in the oral fluids due to [waterborne fluoride] has an important relationship to the reduced caries experience observed in the high F area,” their conclusion can be questioned, particularly as it relates to the 0.7 ppm water F level used in fluoridated communities.

So, what is the evidence that the saliva and plaque levels produced by fluoridated water exerts a significant topical benefit? According to the reviews that Ken cites (and the notably few studies that these reviews reference), the average saliva F level among children in a community with 1.2 ppm fluoride is 16.5 ppb with daily fluctuations that range as high as 144 ppb (Oliveby 1990, cited by Cury). To put these saliva levels in context, Featherstone states that 30 ppb is the lowest level at which fluoride has been observed to have an effect on tooth mineralization, with >80 ppb being the “optimum” (Featherstone 1999). Featherstone supports this statement by citing a single study – Brown (1977). Assuming that Brown’s study can be replicated, it is evident that the average saliva F level in a 1.2 ppm community — let alone a 0.7 ppm community — is not sufficient to affect tooth mineralization. Any topical effect of fluoridated water, therefore, must either come from the transient spikes in saliva F or the residual F in plaque. Judging by the papers Ken cites, the evidence supporting either of these scenarios is meager at best.

I’ll start first with the transient spikes in saliva F. While spikes in saliva F in fluoridated areas can exceed the levels (30 to 80 ppb) that Featherstone claims can affect teeth, this does not tell us a great deal. To be relevant, it must be shown that the transient spikes are not only high enough, but *long enough*, to have an effect. Neither Featherstone, nor any of the other papers cited by Ken provides data to answer this question. Further, even if the transient spikes are of sufficient duration to have an effect, it must be asked whether this effect is of any practical import in the current era when the vast majority of children in non-fluoridated areas brush their teeth with fluoride toothpaste? The importance of this latter question is obvious in light of Featherstone’s observation that “fluoride can be retained at concentrations in the saliva between 0.03 and 0.1 ppm for 2-6 hours” after the use of fluoridated dental products.

I’ll now turn to the question of plaque fluoride. Only one of the papers cited by Ken appears to provide any data on the difference in plaque F levels between fluoridated and non-

fluoridated communities (Cury & Tenuta 2008). The plaque F data that Cury & Tenuta cite is not only unpublished, but is at rather stark odds with previously published data (See Whitford 2005). Cury & Tenuta claim “an almost 20-fold difference” in plaque F levels (3.2 ppm vs. 0.2 ppm). Whitford, however, found far higher F levels in the plaque (~50 to 450 ppm) and a far smaller difference (2-to-5 fold) between the fluoridated and non-fluoridated community. But Whitford’s study was itself quite peculiar as the unfluoridated community was in Brazil, but the fluoridated community was in the U.S. If children in the U.S. community had greater exposure to fluoride from other sources (which is not only possible, but likely), then the difference in plaque F levels is even smaller than Whitford’s study suggests.

In any event, whatever the difference in plaque F levels is, we should have ample data showing that this differential is sufficiently large to produce a significant and practical effect. I am unaware of any such study, so I will be quite curious to see how many Ken can cite. This shouldn’t, of course, be a difficult task: if plaque F is considered the main vehicle by which fluoridated water exerts a topical benefit, there should be no shortage of primary studies that Ken can cite demonstrating that the plaque F seen in fluoridated areas [x plaque F level] is far superior to the plaque F level seen in non-fluoridated areas [y plaque F level]. I look forward, therefore, to seeing the studies that Ken cites — particularly when considering that Buzalaf found that toothpastes containing 500 ppm fluoride are not effective at controlling caries (Buzalaf 2013). By way of reference 500 ppm is more than twice the background plaque F levels seen in fluoridated areas according to Whitford, 2005.

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Ken Perrott - December 9, 2013

Discussion in comments section: The quality of the discussion in the comments section accompanying this exchange impresses me. We have kept out the trouble makers who generally dog this issue and this blog by moderation. But the level of knowledge and familiarity with the scientific literature of commenters is higher than is usual. Most of Paul Connett's associates at his organisation Fluoride Alert are contributing and many of the commenters have a background in relevant professions.

So I urge readers to dip into these comments. Yes, there are a large number and it can get confusing. But some of the issue discussed in the exchange are thrashed out in greater detail in the comments. You will find useful information and arguments presented, as well as helpful literature citations.

In his last article Paul adopted an approach of attack and discredit and did not deal with most of the issue I raised. He continues to ignore, or even downplay, issues like the normal role of fluoride in bioapatites, the recognised systemic benefits of fluoride, the poor quality or inappropriateness of many of the studies he relies on (and of the journal *Fluoride* he promotes). This is accompanied by an attack on a broad front where he poses no less than 10 questions he demands answers to.

I had expected he would be raising his issues in a more detailed way, one at a time. Laying out his arguments and evidence. But in one go he has thrown them all into the ring without any preparation. It's a real Gish gallop – suddenly demanding answers about arthritis, kidney function, thyroid function, osteosarcoma, individual sensitivity to fluoride, menstruation, effect on babies, monitoring bone concentrations and finally, all or any health concerns in New Zealand. Without any background to any of the issues. (Wikipedia describes Gish gallopers as using “a rapid-fire approach during a debate, presenting arguments and changing topics quickly”).

Is Paul “going for broke?” It looks like a military exercise but I wonder what military experts would think of the tactics he is using.

Obviously I am not going to walk into the trap of fighting on so many ill-defined fronts. But Paul has at least defined 3 key areas he expects to be tackled – ethics, efficacy and safety. I will restrict my response to these but add some general comments on the nature of science which I think need to be made. But please, note – I am not avoiding those questions – let's deal with them in a proper way where we have the context and background.

Readers may also see that some of these questions are being discussed and answered in the comments section.

Ethics

I am pleased Paul gave such a prominent role to ethics in his last article but disappointed he reduces the ethical aspects to simply his wish to define fluoridated water as a medicine. If that exhausted the ethical aspects the discussion would now be over as no court has accepted this definition in a final way. A Pennsylvanian anti-fluoridation group ActionaPA.org even laments:

“While the courts have acknowledged that fluoridated chemicals are hazardous, the courts have overwhelmingly ruled in favor of water fluoridation whenever the courts were asked to rule on the merits of fluoridation or on the right of government to fluoridate. The courts have consistently brushed aside the scientific and ethical matters raised by safe drinking water advocates, while deferring to the opinions of pro-fluoridation state authorities. These decisions have formed a body of case law so one-sided that the courts have allowed this momentum to justify further pro-fluoridation decisions.”

Paul will correct me if I am wrong – although I would have expected he would already have mentioned any decision favouring his argument. The fact that he hasn't is telling.

Legal definitions and legal actions

Bill Osmunsen (the West Coast Spokesman for Paul Connett's activist organisation Fluoride Alert) vigorously pushed the “fluoridation as a medicine” argument in the comments sections of this exchange. Paul works closely with him and James Robert Deal who runs the organisation Fluoride Class Action which aims to achieve a legal ruling declaring fluoridation illegal. So I expect Paul would know of any final ruling declaring fluoridation a medicine. (James has also been contributing to the discussion in the comments sections).

Bill was unable to give a clear example of any regulations which define fluoridation as a medicine. Despite this, and the lack of any legal support, this is a common argument used by anti-fluoridation activists. In the end it relies on circuitous interpretations of regulations and a certain degree of hand waving . I don't propose discussing it further here – except to comment on a recent use of this argument by anti-fluoridation activists in the NZ High Court. This shows how such legal action can play a legal role, even where chances of legal success are remote.

The Hamilton City Council recently voted to defer an expected decision to restore fluoridation to the city after an overwhelming referendum result showing voters wanted it. The reason for deferral was to await the High Court decision on the case taken by the NZ Health Trust who argue the South Taranaki Council is breaking the law and breaching the New Zealand Bill of Rights Act by adding a substance they claim is akin to a medicine to the water supply. Some Hamilton Councillors were swayed by arguments that similar action could impose high costs on their own council.

Institutions and bureaucrats are easily pressured by legal action – **even just the threat of legal action**. Several time in my research career managers prevented me from publishing

research findings on some products because the distributors who didn't like the findings **threatened** legal action if the data were published. I can see similar things happening here as the Taranaki High Court decision will most probably be unfavourable to the Trust and it will appeal. Such a process could go on for several years. Meanwhile other councils, and even individual councillors, will feel intimidated by similar threats of possible legal action.

Ironically the NZ Health Trust has been very active in fighting any legislation for regulating natural health products because they do not wish to see these products classified as drugs. And here they are attempting to argue that fluoridated water is a drug! The Trust is also active on issues such as Chemtrails, vaccinations, opposition to conventional health, etc. in effect they are advocating for people with some very whacky ideas as well as for the alternative health and medicine industry which is quite a big business in New Zealand. In a recent Listener review Sally Blundell described the vitamin and natural supplement sector as a US\$34 billion business (see *The final vitamin question*). Add the alternative health practitioners and we can get an idea of the commercial forces behind the anti-fluoridation movement.

Another organisation threatening legal action is Fluoridegate legal action NZ. This is an obvious astroturf organisation for the local Fluoride Action Network of NZ (FANNZ). Like the other astroturf organisation the New Zealand Fluoride Information Service they operate out of the same address as FANNZ and are used in letter writing campaigns and press releases.

Balancing personal choice and social good.

Most anti-fluoridation articles and propaganda just don't attempt this balance. At most they might stress the need for individual freedom of choice but give social good a miss. Usually ethical considerations are limited to arguments around the concept of fluoridated water as a drug or medicine, as Paul has done.

More serious authors do consider ethics as basically about this balance. In principle one could consider this balance as represented in values and political attitudes. But in practice this is often distracted by appeal to scientific claims, even scientific misinformation. Some ethicists, whose understanding of the science may be rudimentary and/or distorted sometimes allow this poor knowledge to distort their ethical calculations and conclusions.

In the day-to-day political debate such scientific misinformation regularly diverts ethical discussions. In the words of Prof Gluckman in his article *What is in the water?*:

“The misuse or inappropriate and alarmist use of science is a classic example of science being a proxy for values debates.”

It is a difficult issue because while science cannot make values decisions for us, such values considerations need to be informed by the science. And if they are informed by bad science there is a good chance the ethical conclusions will be wrong.

In my experience debating opponents of fluoridation it is easy to get them to agree decisions like this are political- or values-based but in the ensuing discussion they find it very hard to argue out the values issues. Very often the discussions end up being about the correctness of a scientific claim they make. The science proxy takes over and the real issues are ignored.

Why is this? In many cases I think anti-fluoridation activists have not thought the ethical questions through completely. They have got stuck on the “*fluoridated water is a drug*” or “*personal choice*” arguments and have never really considered the social good aspect in any depth. So as soon as they feel challenged on the ethics they will resort to using scientific misinformation – dragging in a proxy.

In other cases I have heard a few fluoridation opponents stick to the ethical argument. Refuse to discuss the science and declare that for them it is just about personal choice. This is more honest – but again it is hard to get into the social good aspects because these people usually just don’t want to even consider it, or even denigrate the very idea. Often these people will declare they are libertarian in their political outlook.

Possibly in the end that is what the issue reduces to – one’s political/values outlook. Not a scientific issue resolvable by research and often not even resolvable by reason and logic. Emotion inevitably plays a large part in such values. In a democratic society these issues have to be resolved (if only in the short-term) by transparent consultation and referenda with the minority accepting majority decisions. It is immature not to accept that.

As social animals we are always balancing social issues against personal ones. It is part of living in a social group. I believe that to stress only one aspect is the mark of an extremist. Most people are happy to accept a democratic decision on the balance.

It is disingenuous to see a decision about social good amounting to the minority having something forced on them. As a society we support free public hospitals and secular schools. A minority refuse to use these facilities and they are not forced to. They can make their own arrangements and many do. Private schools and private healthcare is common. The cost for people who wish to opt out of the community water supply is surely minor compared with education and hospitals.

Fluoride sensitivity?

Another common argument relates to the claimed 1% (or 3%) of the population who are supposedly over sensitive to fluoride and suffer all sorts of symptoms when water is fluoridated. I am happy to concede there may be a small number of people like this – as for other common chemicals in the environment. Frustratingly, the evidence for fluoride sensitivity usually comes from unavailable old papers or very poor research (as Paul’s citations are) or (most often) personal anecdote. At least some of these personal anecdotes may be honest-but-psychological as a study of the persistence of symptoms when residents were told that fluoridation existed even though it had stopped shows (see [*Fluoride sensitivity – all in the mind?*](#)). Frankly, I think at least some of these anecdotal claims are really

politically motivated – they often come up when local councils hear submissions from anti-fluoridation activists and are not supported by medical assessment. These appeals rely solely on emotion and empathy.

Those people with a genuine sensitivity to common (and often naturally occurring) chemicals in our environment face us with that balance issue. To what extent should society deny itself something beneficial to protect the interests of a very small minority? Very often society does decide that such small groups of people must take responsibility for their own condition and handle their own requirements. Maybe the most empathetic solution is that society as a whole compensate this small number of people in some way to aid them with their predicament.

Social health policy

Finally, I think many people just don't have a concept about the nature of social health policies? Or the benefits they bring to society as a whole.

Declaring that people should add their own fluoride to their water, learn how to brush their teeth, etc., ignore the reality of life for so many socially and economically challenged families and their children. Choices like this often cannot be made, or even thought about. (Let's face it – this is also very often the case with those who are not socially or economically disadvantaged). A social health policy like fluoridated water or salt, and iodised salt, works with such people (in fact with most people) precisely because it requires no action on their part.

Simple declarations that we should not have to bear a financial responsibility for those who are not responsible enough to care for themselves and their children gets into “cutting of noses to spite faces” territory. It is in the best interests, financially and socially, of all of us that children do not grow up disadvantaged by poor oral health. It is these children who will in future be paying the taxes to support us in our old age, and providing the services and goods we consume. Let us make sure, even from a purely selfish point of view, that these children grow up to become good citizens with fulfilled lives and the skills and education necessary for this.

Surely it is ideologically extreme to not accept this logic?

Real world science

Paul is a political polemicist, certainly not a scientist, when he demands the knowingly impossible.

He wants studies showing that fluoride *“is not increasing the risk of arthritis,” “causes no damage to individuals with impaired kidney function”* and *“is not increasing the risk of lowered thyroid function.”* He asks for scientific evidence indicating *“that fluoride is not a neurotoxicant.”* And, of course, when I don't produce the impossible proof of a negative he,

and his fellow anti-fluoridation activists, respond by taking this as “proof” that their claims are true. Are somehow proven! If only science was that easy.

“*There could be a problem, so prove that there is not*” is a fallacious tactic (see [The negative proof fallacy](#)) that has come up again and again in the comments discussion and I probably can’t do better than quote from Steve Stott’s patient replies:

“Requiring proof of a negative is an endless process which is not valid science.” “It is impossible to prove every conceivable, unsubstantiated contingency that anyone, anywhere can put forth. Valid evidence that a problem exists must be provided before credibly demanding proof that it does not.”

Isn’t this argument for negative proof the same as the tactic we have become very familiar with from creationists in their attacks on evolution?

Paul’s characterisation of the lack of randomised controlled trials (RCT) and the poor quality of much of the research in this area as problems only for supporters of fluoridation is similarly a political trick. These issues are ones for science in general. Science does not differentiate between supporters and opponents. The opponents of fluoridation are just as plagued as the supporters by the lack of RCTs and the poor quality of many published papers. It is their “fault” as much as that of supporters that there are insufficient research reports on this area of interest. If in fact these are genuine problems for all of us – why blame them only on proponents of fluoridation? That is a political, not a scientific, tactic.

After all, anti-fluoridation opponents keep telling me they have science on their side, they have the support of most scientists on their stance and they keep providing me supportive quotes from Nobel Laureates and “top scientists.” Shouldn’t they be levelling these criticisms at the anti-fluoridation scientists and researchers who they believe are so numerous? Or are these charges an admission of the falseness or irrelevance of their claims?

Paul’s own responsibility

More directly, Paul claims to have been researching fluoride for 17 or 18 years. He promotes his book as the last word on the subject and compulsory reading for anyone wishing to comment in this area. Many anti-fluoridation activists describe Paul as the world’s top expert on fluoride. He makes submissions to community hearings on fluoridation – often by video link from the other side of the world.

So why is he not taking some responsibility for the lack of RCTs? What has he done to plan or put such trials into action? Why does he blame others for apparent lack of research. Surely if he in his wisdom had deemed such research necessary he would have been one of the first researchers to propose, plan and carry out the research?

Come to think of it – with such a reputation it is reasonable to expect a body of publications in reputable peer-reviewed scientific journals. My simple searching does not show any,

although he does list 2 which I could not find on-line in a recent CV. Could Paul give us a relevant publication list? And links to the papers?

Is Paul's judgement of the research too harsh?

Both sides should be pointing out the real world problems we face as scientists. Humans cannot be treated as laboratory subjects. We cannot realistically segregate a population to the degree required for randomised double-blind studies because of all the confounding factors and the halo effect. This it is a problem for both opponents and proponents of fluoridation. It is dishonest to pretend that one side is being devious or avoiding the issue. Rather than making such charges people should consider the evidence that does exist (and this does include the randomised double-blind study of Stephen et al (1984) which showed beneficial effects of fluoridated milk on oral health – see *Five-year double-blind fluoridated milk study in Scotland*).

I often feel the York review was a little harsh to stress the poor quality of some of the available research on fluoride. Genuine science must work with the world as it is. It gets by with epidemiological studies where ideal controlled studies are impossible or too difficult. Scientific knowledge is always provisional, open to improvement as new data and findings come in. Scientific inference on safety and efficacy uses existing information and is not put off until the impossible final experiment can be done. Humans are used to operating in this way, of accepting there will always be some areas of incomplete knowledge, some untied strings, some small doubts and some future work to do. In that sense it is just political disingenuousness to promote the slogan “*if in doubt leave it out.*” Or to demand, as many anti-fluoridation activists do, that there should be no fluoridation until every scientific i is dotted and every t crossed. There is always some degree of doubt and the final is and ts are never dotted and crossed.

Citation battles

When science-oriented people debate controversial issues I sometimes feel I am in the middle of an intense citation battle. Each side throws our references claiming they support their position. Often they accompany the reference by a brief quote. It's like an intense battle using barrages of paper darts or a game of citation tennis.

This is aimed at establishing credibility – but does it? I suspect more often than not it turns people off – especially those unfamiliar with the literature. And when those that are familiar retaliate with their own brief quote and citation to clarify it is just seen as part of a citation war.

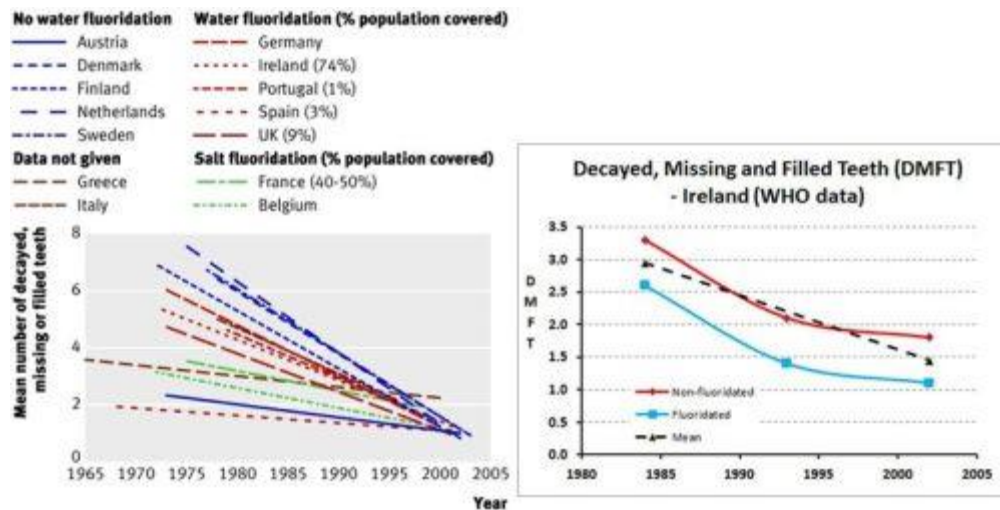
People need to calm down, stop throwing around citations and quotes in this manner and calmly look in detail and context at the real scientific findings. Yes, unfortunately, this usually requires access to the full text of papers and not just using Google with a good dose of confirmation bias.

So, I am not impressed by Connett’s paragraph of about 30 unexplained citations – nor by a long reference list at the end of his article. I am not impressed by the way that anti-fluoridation activists often throw around citations they have never read – or if they have, not past the abstract. Usually they are just copied and pasted from Fluoride Alert without any critical consideration at all. No wonder some of us look on this naive appeal to authority as a sort of citation Bingo. Just waiting for Choi et al (2012) or “Harvard Study” to be thrown at us.

Bingo!

Repeated citing of flawed papers

Paul might consider that attitude harsh – but let’s take one paper he cites in his list of 30 – Cheng et al (2007). He referred to this paper also in his first arguing that Cheng et al’s figure (on the left hand below) shows fluoridation ineffective. I pointed out his conclusion was unwarranted because of the weakness of the data and influence of confounding effects in inter-country comparisons. I illustrated this by showing that the data for Ireland could be separated into fluoridated and unfluoridated components (see right hand figure). And this comparison within one country (with fewer confounding effects) illustrates that fluoridation was effective.



The dotted line in the RH figure is effectively what Cheng et al (2007) used for Ireland in the LH figure.

Paul brushed off my response by saying “I would not exclude the researchers’ bias influencing this result!” And he continues to use the same citation. I am sure he will continue to do so in the future despite the criticisms – because he is using these citations like a drunk uses a lamppost – more for support than illumination. He is approaching the literature with a fixed conclusion – searching for citations he can use to support those conclusions, and not basing his conclusions on an objective assessment of the literature.

Selective quoting

And taking just one of the unsupported claims Paul made in his Gish gallop:

“modern studies have not found tooth decay when fluoridation has been stopped in various communities.”

He includes Cuba and is obviously referring to the paper of Künzel & Fischer (2000) – *Caries Prevalence after Cessation of Water Fluoridation in La Salud, Cuba*. Yes this study found no increase in caries after stopping fluoridation and suggested why:

“A possible explanation for this unexpected finding and for the good oral health status of the children in La Salud is the effect of the school mouthrinsing programme, which has involved fortnightly mouthrinses with 0.2% NaF solutions (i.e. 15 times/year) since 1990.”

Similarly he includes east Germany. Künzel et al (200) – *Decline of caries prevalence after the cessation of water fluoridation in the former East Germany* – found no increase of caries in two German cities after fluoridation of water was stopped. But again the authors suggest why:

“The causes for the changed caries trend were seen on the one hand in improvements in attitudes towards oral health behaviour and, on the other hand, to the broader availability and application of preventive measures (F-salt, F-toothpastes, fissure sealants etc.).”

This is the thing about Gish Galloping – it avoids the horrible reality of context and details which often make the claims false. And Gish galloping by citation war is just another way of avoiding context and details but adding a layer of the fallacy of appeal to authority.

On the one hand the offender can pretend extensive knowledge and a damning case (even if one or more of their charges are refuted) – on the other hand his discussion partner can be presented as ignorant and without a case when they don't reply to every single charge in detail.

The IQ gambit

Paul keeps returning to this question. It is obviously central to the message Fluoride Alert promotes and it does seem to catch the imagination of at least some people. How many times have I seen this sort of bald statement on Twitter?



alt_medicine.txt (@altmed txt)

4/12/13 3:51 pm Fluoride acts to calcify parathyroid gland in your brain. That is why HITLER used it in Death Camps. It dumbs you down & makes you complacent.

How often do we have the “Harvard study” thrown at us as final proof that fluoridation lowers IQ?

While getting a boost from the paper of [Choi et al \(2012\)](#) this is an old myth promoted by extreme anti-communist groups like the John Birch Society – the myth also included Stalin’s prison camps. I have always thought this claim weird as elemental lead in the form of bullets is usually a very effective form of control in such prison camps – surely putting fluoride in the water is not as effective?

But conspiracy theorists are not going to give this myth away so easily. It provides handy support for their claims that governments, under direction from the United Nations and as part of Agenda 21, fluoridate our water to produce a population of “sheeples” who won’t revolt! Or that it is some form of population control – even a way of killing off old people!

It is ironic that anti-fluoridation activists will on the one hand stress the observation from the York Review team that much of the research in this area is of poor quality – **and then work hard to drag up any poor quality research they can find to support the claim of an effect on IQ!**

Connett’s pre-occupation with this IQ gambit does raise some questions in my mind. I know he does not wish to be put on the spot for every infraction of his fellow activists. But it would be helpful for him to clarify his own position.

- Does Paul believe in, or support the promotion of, the myth that Hitler and Stalin used fluoride addition to drinking water as a way of maintaining order in prison camps?
- Does Paul believe that the US and some other governments use fluoridation to keep their citizens apathetic? If not is he prepared to criticise his supporter who do, like Anna Goodwin a local FANNZ activist?
- Does Paul agree with his fellow activist who believe that fluoridation is used as a form of population control?

Mechanisms of beneficial action of fluoride.

Misinformation about the mechanisms for any beneficial action of fluoride on oral health is, like the IQ story, central to the political message of anti-fluoridation groups here days. They have seized on improved knowledge about these mechanisms to promote a false scenario. In this they have achieved a certain amount of success. The Hamilton City Council bureaucrats, for example, still promote the message that fluoride water has no beneficial role because fluoride works by topical action (see [Fluoridation Referendum Results](#) prepared for the recent council meeting).

So I am not surprised that Paul persists in denial of the real scientific knowledge about these mechanisms. I will just summarise the misinformation he is promoting.

1: He continues to avoid the issue of a systemic role for fluoride. He says that my “*stating over and over again that the fluoride ion is a natural constituent of apatites doesn’t get us very far.*” **Clearly he does not want to go in that direction.**

The natural scientific concentration on the surface mechanism operating to reduce mineralisation and enhance remineralisation as the major effect in limiting caries in existing teeth does help him a bit. But only by omission and turning a blind eye to the studies showing a systemic role with pre-erupted teeth. Papers like Singh and Spencer (2004). *Relative effects of pre- and post-eruption water fluoride on caries experience by surface type of permanent first molars* and Singh et al (2007). *Effects of Water Fluoride Exposure at Crown Completion and Maturation on Caries of Permanent First Molars*. And dare I repeat Newbrun (2004), *Systemic Benefits of Fluoride and Fluoridation* - a reference he has already ignored.

2: Labelling the scientifically accepted mechanism for the surface reaction with existing teeth as “Ken’s topical mechanism via saliva and plaque” is a really desperate shot. As is talk of “scarce data” because I cited only 4 papers! It is obviously not “my” mechanism but the currently accepted mechanism for the major effects with existing teeth. One could cite expert after expert – none with my name.

However, he has at least tried to deal with the details in some of the papers I cited – far more consideration than he gives to the systemic role of fluoride. But of course he has a preconceived aim of finding any detail which he can use to discredit this currently well accepted mechanism. He relies on claiming that fluoride concentrations derived from drinking fluoridated water in saliva and plaque are insufficient for the mechanism. That they are below a specified required concentration (he has even pulled a value out of the literature from Featherstone 1999). He concedes that maybe these concentrations do spike at a sufficiently high concentration but decline too rapidly to have an effect.

Let’s consider these points:

3: Paul has seized on a value of 30 ppb F in saliva as a minimum concentration for the surface mechanism. I don’t think that is universally agreed – which is hardly surprising because of the complex chemistry involved. The surface reaction is dependent on the concentration of Ca^{2+} , orthophosphate, F^- and not well-defined organic species. It is markedly dependent on pH and the carbonate content of the surface layers of the bioapatite.

The interaction of fluoride with the tooth surface is also a dynamic process. The pH changes relatively quickly, dropping with bacterial action on carbohydrates and then increasing – this influences the surface reactions.

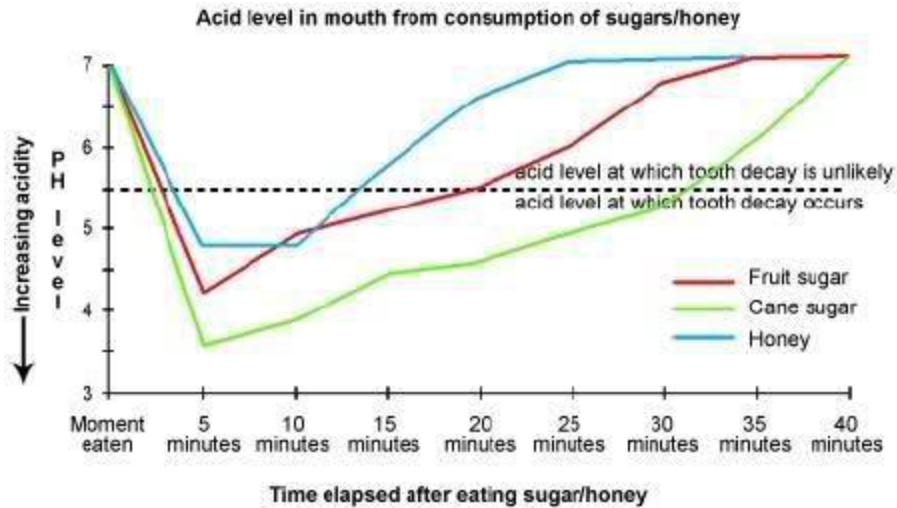


Image credit: SAMPLE #36 WRITING TASK

Mineralisation and remineralisation of surface layers of the teeth is a process see-sawing throughout the day

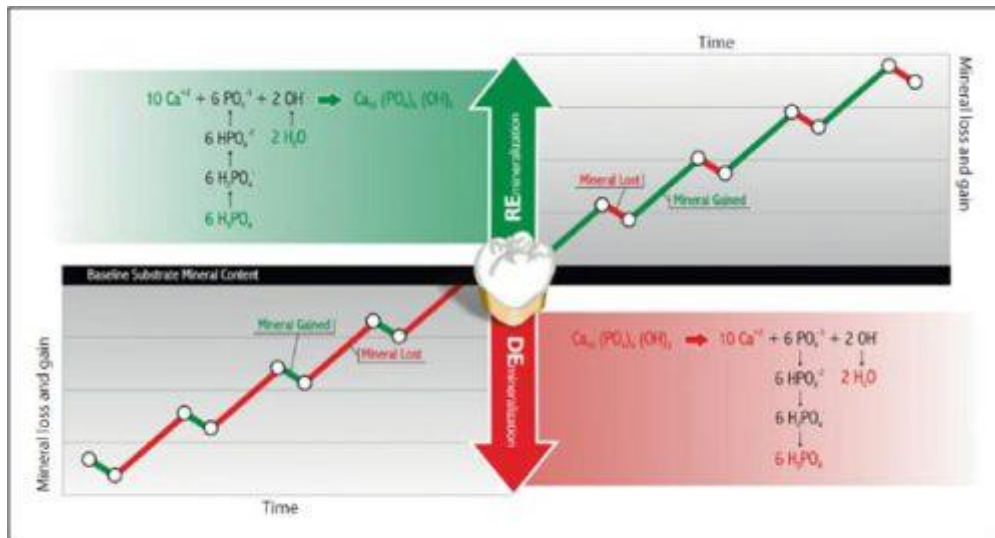


Fig. 4. Cyclic nature of de- and remineralization reactions. Source: Buzalaf et al. [68].

Image credit: Buzalaf (2011), Fluoride and the Oral Environment, Monographs in oral science ; v. 22.

Fluoride in saliva and biofilms on the surface reduces the mineralisation process and enhances the remineralisation process. In simple terms we can understand that as influencing the pH values these process occur at.

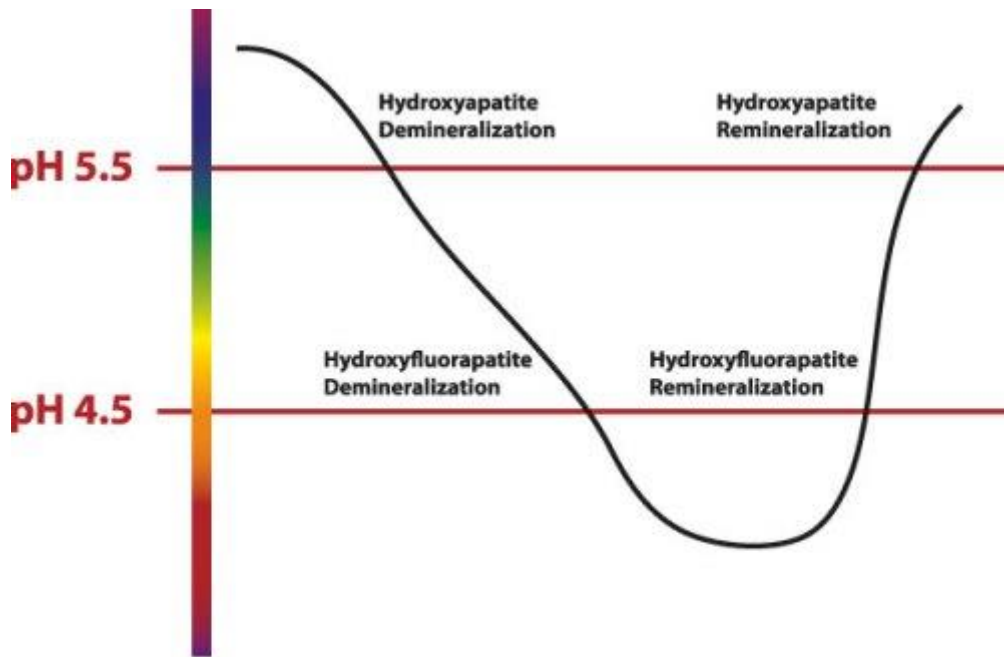


Figure 14. Demin and remin pH levels of hydroxyapatite and fluorapatite

Image credit: Fluoride as a protective factor for tooth decay.

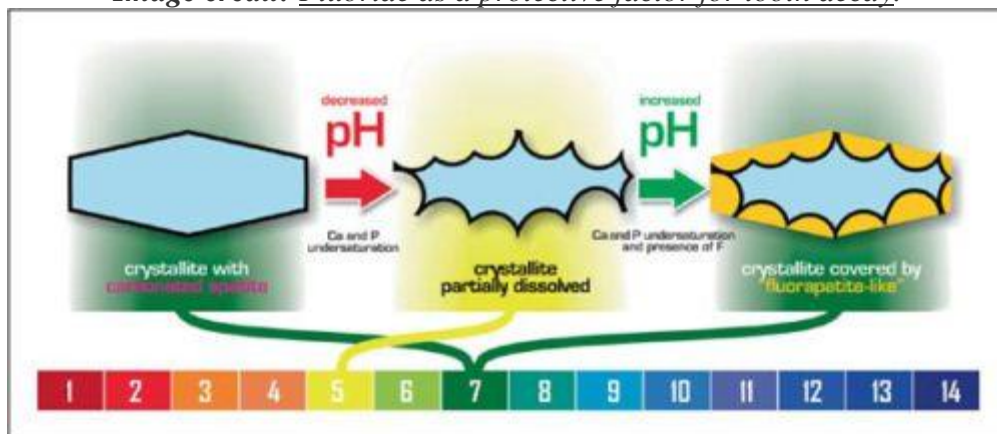


Fig. 9. Schematic representation of remineralization occurring in the presence of fluoride. Fluoride speeds up the process of remineralization and leads to the precipitation of a coat poor in carbonate and rich in fluoride on the partially demineralized original crystallite. This renders the tooth structure more resistant to subsequent acidic challenges. Modified from Featherstone [26].

Image credit: Buzalaf (2011), Fluoride and the Oral Environment, Monographs in oral science ; v. 22.

Yes, fluoride concentrations in saliva and plaque do reach a maximum after drinking water and eating food containing fluoride, as well as after brushing teeth with fluoride containing toothpaste. These concentrations then decline over the next few hours. DenBensten (1996) found salivary fluoride concentrations declined to baseline values 45 minutes after brushing children's teeth. Naumova (2012) showed a similar decline but the figure from her paper illustrates another feature – the high variability of the concentrations.

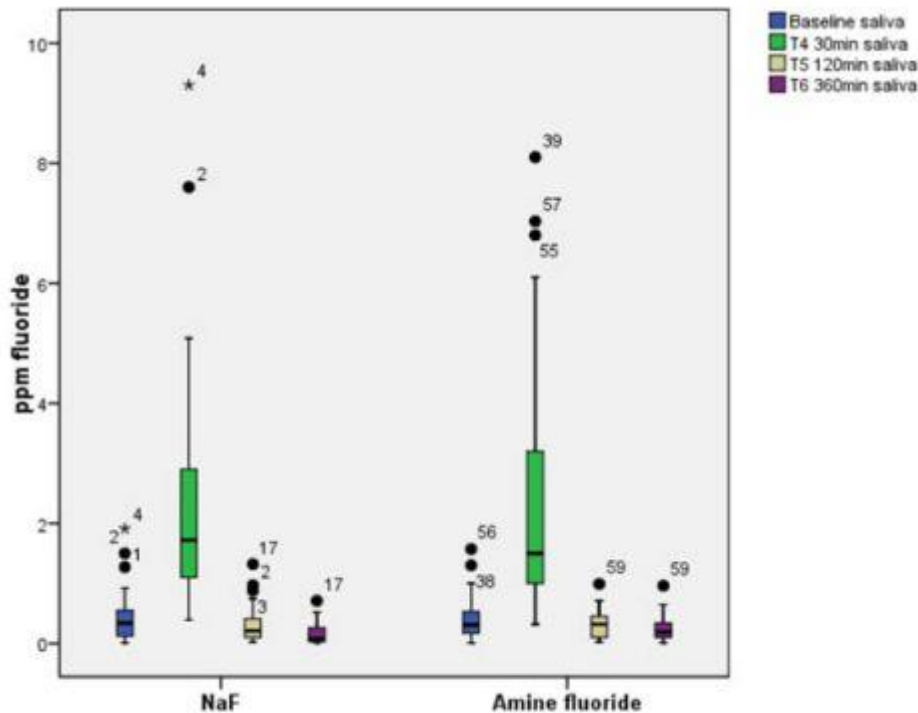


Image credit: Naumova (2012)

However, concentrations in plaque, surface biofilms, decline less rapidly. [Naumova \(2012\)](#) reported elevated plaque fluoride concentrations for 2 hours, decreasing to baseline concentrations in 6 hours. [Petersson et al \(2002\)](#) also found storage of fluoride in plaque for several hours.

4: So fluoride concentrations in saliva after drinking water or eating food containing fluoride can be quite variable. They also decline over time, but the plaque has a storage effect ([Petersson et al 2002](#)). So the beneficial activity of fluoride via a surface reaction on teeth requires relatively frequent fluoride inputs. Fluoridated water provides this. In effect it supplements fluoride inputs via tooth brushing because the latter is far less frequent. In fact [Whitford \(2002\)](#) say:

“Based on these findings and reports in the literature it is concluded that, for persons whose drinking water is fluoridated, plaque [F] throughout much of the day is not significantly increased by the use of a fluoridated dentifrice. Instead they are directly related to plaque [Ca]. These findings offer at least a partial explanation for why fluoridated dentifrices and drinking water have similar cariostatic effects.”

5: [ten Cate \(1982\)](#) reports that susceptibility to mineralisation also declines over time because of the cycling mineralisation-remineralisation procedure. Presumably this is a result of improvement in the chemical composition of surface layers – incorporation of fluoride and removal of carbonate.

So, I wouldn't be putting my money on a single value for the minimum effective value of salivary fluoride concentration required for this surface effect. And I can understand why

some workers insist that even the low salivary fluoride concentration resulting from ingested fluoride could still play a role.

Conclusion

In this article I have dealt in a bit more detail with the ethical questions around the fluoridation issue and the surface mechanisms proving a defence against tooth decay with existing teeth. Despite this, some readers might feel I have spent more of this article attacking Paul Connett's debating methods, and not dealing with the science. My justification for this is the tactics Paul used in his last article, relying on a Gish galloping presentation of a long list of arguments and the fallacy of authority by quoting, without amplification, a long list of citations. This has been combined with the fallacy of demanding proofs of negatives commonly used by science deniers in the creationism-evolution debate.

I think it is necessary to bring these tactics to reader's attention.

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Paul Connett - December 12, 2013

Here is my response to Ken's last response to this thread (part 4).

Propaganda from Queensland Health

1) The pictures below appeared on page 2 of a 4-page leaflet from Queensland Health used to promote mandatory fluoridation in 2007. It compares pictures of the teeth of a child who has had its teeth "exposed to fluoridated water" (beautiful) with the teeth of a child "without exposure to fluoridated water" (atrocious).



In response to this figure Ken writes:

"It seems to have been taken from a document prepared under the Queensland Health logo. I cannot find a source and no-one seems to be able to give a citation. It is not on the Queensland Health web site." (*my emphasis*)

Why does Ken say "seems"? I forwarded a copy of the whole leaflet to Ken. Does he doubt the authenticity of that leaflet? I have no doubt at all about its authenticity. Mind you, I am not surprised – now that citizens in Queensland have pointed out this outrageous piece of state-funded propaganda – that Queensland Health is embarrassed and should want to hide all traces of it.

2) I think it was disingenuous of Ken to try to nullify this outrageous propaganda by providing a link to a leaflet produced by an anti-fluoridation group. The point I was making (in part 3 of this thread – originally part 1A) is that it is one thing for citizens – either promoters or opponents – to use tactics like this (I certainly do not condone or endorse any

side using such tactics) but it is quite another when **bureaucrats working for the state and paid by taxpayers to protect their health** stoop to such tactics. It is unacceptable. Nor should it be necessary if this practice was as “safe and effective” as the promoters claim. Surely the role of civil servants is to provide objective information on a controversial issue not side with one side and then provide outrageous spin in support of that side.

3) Ken did not respond to my other concerns about the propaganda used by Queensland Health. This is less dramatic perhaps but equally deceptive. This was their claim in newspaper ads (see picture below) that there was a 65% difference in tooth decay between fluoridated Townsville and non-fluoridated Brisbane (see picture below).

This glass of water could protect your smile

From next year the State Government will be spending \$35 million to help protect Queenslanders' teeth.

Every other Australian State and Territory has provided fluoride in water supplies to help protect people's teeth for the last 30-40 years.

In Townsville, water supplies have been fluoridated since 1964, resulting in 65% less tooth decay in children than those in Brisbane.

Soon more Queenslanders will have the benefits of fluoride, which is proven to be safe and effective.

We will keep you informed as we get closer to providing fluoride in your local water supply.

Queensland Government
Queensland Health

To find out the facts on fluoride, go to www.health.qld.gov.au

Thursday, December 6, 2007 The Courier-Mail

To get this 65% reduction Queensland Health had selected the number for the *relative* difference for just one age – 7 year olds. In Table 4 – in the paper by Slade et al., (see below)

readers will see that this 65% *relative* reduction amounted to an *absolute* saving of a measly 0.17 of one tooth surface. Their *arithmetic is accurate* but a 65% reduction sounds a whole lot more impressive than a saving of 0.17 of one tooth surface. This is a deliberate attempt to mislead the public. In other words, it's PR spin. I would be interested to hear how Ken would describe it.

Table 4: Caries experience (decayed, missing or filled surfaces) in the permanent dentition

Age [years]	Townsville DMFS ^a			Brisbane DMFS ^a			Difference		Prevalence	
	n	Mean	SD ^b	n	Mean	SD ^b	%	Absolute	Townsville	Brisbane
6	300	0.04	0.23	472	0.10	0.54	60	0.06	4	4
7	240	0.09	0.37	440	0.26	0.83	65	0.17	6	13
8	262	0.23	0.68	375	0.52	1.09	52	0.27	15	26
9	226	0.41	0.93	403	0.51	1.05	20	0.10	24	26
10	205	0.57	1.10	387	1.13	1.96	50	0.56	29	42
11	188	0.65	1.26	370	1.45	2.25	55	0.80	31	48
12	69	0.94	1.63	205	1.80	2.79	48	0.86	36	54

Note: (a) DMFS = number of decayed, missing or filled surfaces per child. (b) SD = standard deviation

Returning to the photographs in the Queensland Health brochure, does the difference in these two sets of teeth look like a difference of 0.17 of one decayed, missing and filled permanent tooth surfaces (DMFS)?

I wish I could say that this blatant propaganda on behalf of personnel at Queensland Health is an aberration among civil servants in the health agencies of the countries practicing fluoridation. Sadly, from my personal experience, it is not.

I have seen first-hand outright propaganda from people at the highest levels of civil service in the health agencies of several fluoridating countries as well as their minions in their bureaucratic chain of command.

The propaganda of these civil servants is shameless but sadly gobbled up by the media and too many local decision makers in their respective countries. One would have hoped that scientists like Ken Perrott with their sensitive antenna to scientific misrepresentation would have helped expose this sad state of affairs. Instead of doing this they fire their rhetorical guns at the citizens who are doing their very best – with limited resources – to bring this state-financed propaganda to the attention of the media, the public and their political representatives – but it is an uphill job.

4) In NZ the manipulation of the science on this practice goes back a long way – in fact to the very first trial of fluoridation in Hastings (with Napier as the control city). This trial was carried out from 1954 to 1964 and has been shown by the late Dr. John Colquhoun and his PhD thesis advisor Dr. Robert Mann and others to have been a *scientific fraud* (Colquhoun and Mann, 1986; Colquhoun, 1987 and Colquhoun and Wilson, 1996).

5) Ken might wish to comment on the following candid letter sent out by the Director of the Division of Dental Health, Dr. G. H. Leslie, in 1962 – *some eight years* into this 10-year trial.

12 October, 1962-

Mr Swann:

I have delayed acknowledging receipt of Dr Roche's letter to you and replying to your minute in the hope that I would by now be able to give a positive reply to your enquiry. I still cannot.

No one is more conscious than I am of the need for proof of the value of fluoridation in terms of reduced treatment. It is something which has been concerning me for a long time. It is only a matter of time before I will be asked questions and I must have an answer with meaning to a layman or I am going to be embarrassed and so is everyone else connected with fluoridation. But it is not easy to get. On the contrary it is proving extremely difficult. Mr Espia is conferring with Mr Bock and Mr Ludwig and I am hopeful that in due course they will be able to make a practical suggestion.

I will certainly not rest easily until a simple method has been devised to prove the equation fluoridation = less fillings.

(G.H. Leslie)
Director
Division of Dental Health

I have typed out this letter to make it easier for people to read, as some of the letters are not clear:

Mr. Swann,

I have delayed acknowledging receipt of Dr. Roche's letter to you and replying to your minute in the hope that I would by now be able to give a positive reply to your enquiry. I still cannot.

No one is more conscious than I am of the need for proof of the value of fluoridation in terms of reduced treatment. It is something which has been concerning me for a long time. It is only a matter of time before I will be asked questions and I must have an answer with meaning to a layman or I am going to be embarrassed and so is everyone else connected with fluoridation. But it is not easy to get. On the contrary it is proving extremely difficult. Mr. Espia is conferring with Mr. Bock and Mr. Ludwig and I am hopeful that in due course they will be able to make a practical suggestion.

I will certainly not rest easily until a simple method has been devised to prove the equation fluoridation = less fillings

(G.H. Leslie)

Director

Division of Dental Health

6) With this letter we have what amounts to a "smoking gun" as far as the inability of NZ dental officials and researchers to show the effectiveness of fluoridation – *some eight years into the ten-year Hastings-Napier fluoridation trial.*

7) However, miraculously, two years later this trial was proclaimed as a great success at demonstrating that fluoridation had led to a large reduction in tooth decay (over 60%) and the result was used to push for fluoridation throughout the country.

8) So how in the space of two years was this dramatic turnaround achieved?

9) According to Dr. John Colquhoun's research it was a complete artifact. The deception was in three parts. First, after about two years the control city of Napier was dropped for bogus reasons. Two, the reduction in tooth decay claimed was based on comparing tooth decay in Hastings at the beginning and the end of the trial (and not a comparison between tooth decay in Hastings and Napier). Three, method of diagnosing tooth decay was changed during the trial. Colquhoun describes this third aspect of the deception:

“The school dentists in the area of the experiment were instructed to change their method of diagnosing tooth decay, so that they recorded much less decay after fluoridation began. Before the experiment they had filled (and classified as “decayed”) teeth with any small catch on the surface, before it had penetrated the outer enamel layer. After the experiment began, they filled (and classified as “decayed”) only teeth with cavities, which penetrated the outer enamel layer. It is easy to see why a sudden drop in the numbers of “decayed and filled” teeth occurred. This change in method of diagnosis was not reported in any of the published accounts of the experiment.”

What qualifies these activities as scientific fraud, in my view, is the last sentence: **“This change in method of diagnosis was not reported in any of the published accounts of the experiment.”**

10) To the best of my knowledge the evidence that Colquhoun and Mann put forward for this *rigged* trial has never been refuted. I would be anxious to see if Ken can throw a different light on this matter. If he can't then I think that he and other NZ citizens should be concerned that the people of NZ were duped in this way.

Ken was unresponsive to many of my other concerns expressed in parts 1 and 1A (or parts 1 and 3 in my thread, The Arguments Against Fluoridation).

11) Ken didn't address the key issue of the difference between **concentration** and **dose** when comparing artificially fluoridated communities and naturally fluoridated study communities when harm has been identified.

12) He didn't address the need for a **margin of safety** calculation when determining a safe dose for a community based on a human study that has found harm (see chapter 20 in *The Case Against Fluoride...*). Nor did he comment on the sample margin of safety analysis that I provided based on the Xiang et al. (2003a,b) study, although he has commented on the Xiang study elsewhere.

13) He didn't comment on my response to his claim – *that there was no need to control the dose as far as efficacy was concerned because it worked over a wide range*. I pointed out that there was not a wide range as far as **safety** was concerned and gave this information:

“I would also remind you that when the US National Research Council reviewed the toxicology of fluoride in water they concluded that several subsets of the US population were exceeding the US EPA’s safe reference dose for fluoride (the so-called IRIS value) of 0.06 mg/kg/day. This included high water consumers and bottle-fed infants. See Figure 2.8 in their report (NRC, 2006).”

14) Ken is ducking a key issue when he writes:

“It is pointless to continue debating definitions of fluoride as a medicine – as I have said the argument is largely semantic. People who wish to pursue the argument should do so in a court of law.”

Is he suggesting that in order to get a rational response from him on this matter I have to take him to court? Joking apart, surely he can concede that the purpose of fluoridation is to *treat* people as opposed to treating the water to make it safe or palatable to drink? And if he is willing to concede that then doesn’t treating people – at least in some countries – require that those treated have the right to informed consent to that treatment? This is not just about semantics it is about fundamental human rights. See the definition of medicine and medical treatment under EU law which I provided in the other thread (part 6).

15) Instead of providing me with examples of statements from countries in Europe that have rejected fluoridation for reasons other than the two main ones I cited, Ken fobs me off with a statement from the NZ National Fluoride Information Service. In this statement this body gives no specific examples of countries that have not fluoridated for the reasons it – or Ken – states. **So I will ask him again.**

Ken please provide some evidence that countries have not fluoridated for the reasons you have given as opposed to the reasons I have given, namely: they do not wish to force fluoridation on people who don’t want it and they argue that there are unresolved health concerns about the practice.

16) When Ken restates that:

“For the vast majority of people who have dental fluorosis (recognised by a professional) it is usually classified as “questionable” or “mild.” Real health concerns should only be raised for severe dental fluorosis. Yet anti-fluoride activists lump all those grades together and pretend that dental fluorosis is a much bigger problem than it really is.”

Ken has essentially ignored all the information I provided for him on this issue. I provided the figures cited by the CDC (2010) for dental fluorosis for children aged 12 to 15 in the US. In this report, they indicate that *very mild* dental fluorosis impacts 28.5% and *mild* dental fluorosis impacts 8.6% of the population in question. *Mild* dental fluorosis affects up to 50% of the tooth surface and presents potential psychological problems for young teenagers. Ken may not consider that a “real” problem but many teenagers do. Ken might also be interested to know that Trendley Dean, the so-called father of fluoridation, who developed this first classification of dental fluorosis in the 1930s, in testimony before the US Congress stated that

mild dental fluorosis was an unacceptable trade-off for reduction in tooth decay (see chapter 11 in *The Case Against Fluoride...*).

Moreover 3.6% of US children aged 12-15 have dental fluorosis in either the *moderate* or *severe* category. In these categories 100% of the enamel of the impacted teeth is impacted. Neither of these categories is desirable. 3.6% of all the children aged 12-15 in the US is a lot of children!

17) Ken also claimed that there was practically no difference in dental fluorosis prevalence between fluoridated and non-fluoridated communities. He ignored my response. I cited the study by Heller et al (1997), which clearly showed that that was not the case. They found that as the fluoride levels rose from a) less than 0.3 ppm, to b) 0.3 to 0.7 ppm, to c) 0.7 – 1.2 ppm and then d) above 1.2 ppm there was a marked increase in dental fluorosis rates.

18) I offered an animal study (Varner et al, 1998) in which rats were exposed to 1 ppm fluoride (administered either as AlF₃ or NaF) for one year and experienced harmful effects. I provided this reference because Ken stated that he paid no attention to animal studies performed at high concentrations and that was all he was offered by opponents of fluoridation. However, I got another brush off from Ken. He claimed that he couldn't find the whole study by Varner et al – only the abstract – and after a few words on the abstract then stated, "I won't comment further on this." First, of all I am surprised that no University in the Hamilton area carries the journal *Brain Research* where the Varner paper appeared. Also if Ken was having trouble finding this all he had to do was email me and I would have forwarded him a pdf copy of this paper. For future reference I would be happy to do that for all the papers I cite.

19) Nor did Ken respond to the discussion in which I pointed out that the US Food and Drug Administration classifies fluoride for ingestion as an "unapproved drug." This means that in the U.S. fluoride intended for ingestion has never been subjected to the double blind randomized control trials (RCT) for efficacy that are required of all other drugs. Nor is the FDA tracking side effects from patients or doctors, despite the fact that many individuals claim to be highly sensitive to fluoride's toxic effects. The same professional and regulatory *neglect* appears to have occurred in all other fluoridated countries, including New Zealand.

Note: I have raised more specific questions about this professional and regulatory neglect in my latest response (part 6) in the other thread.

20) Ken claimed (in part 2 of this thread) that there was no difference between naturally fluoridated water and artificially fluoridated water and I responded in part 3 that:

"Usually when fluoride occurs naturally in the water it is accompanied by large concentrations of ions like calcium. The presence of the calcium can reduce the uptake of fluoride in the stomach and GI tract. No such protection is offered when the fluoridating chemicals are added to soft water."

Ken did not acknowledge this important difference.

21) In my response (part 3 of this thread) I wrote:

“In my opening statement I singled out three subsets of the population that shouldn’t be getting fluoridated water: bottle-fed babies, people with poor kidney function and people with outright or borderline iodine deficiency. Ken chose not to comment on the latter two groups. In my view we should be concerned about both groups whether they are drinking naturally occurring fluoride or artificially fluoridated water.”

For the second time Ken chose not to respond to these concerns. Ken is certainly very sensitive to the treatment of low-income families because of his own personal history but he seems not to be as sensitive to the fate of these subsets of the population.

22) Ken chose not to respond to this question:

“Is it not reckless then to knowingly expose the bottle-fed baby to 175-300 times more fluoride than the breast-fed baby? Especially, when we know that fluoride can harm at least one developing tissue in the baby – the growing tooth cells – at very low levels and cause the condition known as dental fluorosis. What makes us believe that while the fluoride is damaging processes in the growing tooth it is not doing the same to the growing bone. After all the teeth grow out of the bone.”

23) Ken chose not to respond to the following information:

“Even when some warning signals emerged during the early trials they were cavalierly ignored by those hell-bent on promoting this practice. For example, when Schlesinger et al., 1956, published the results of the Newburgh-Kingston trial in 1956 they reported that young girls in the fluoridated community were menstruating 5 months earlier on average than the girls in the non-fluoridated community, and that the young boys were experiencing about twice as many cortical bone defects in the fluoridated community compared with the non-fluoridated community. However, no follow-up studies were recommended (see Chapters 9 and 10, *The Case Against Fluoride*...). These red flags were ignored then just as the studies indicating a lowering of IQ associated with fairly modest levels of fluoride exposure, are being ignored or downplayed by proponents today.”

24) Ken chose not to respond to Dr. Hardy Limeback’s discussion of possible ways that fluoride can interfere with normal bone growth:

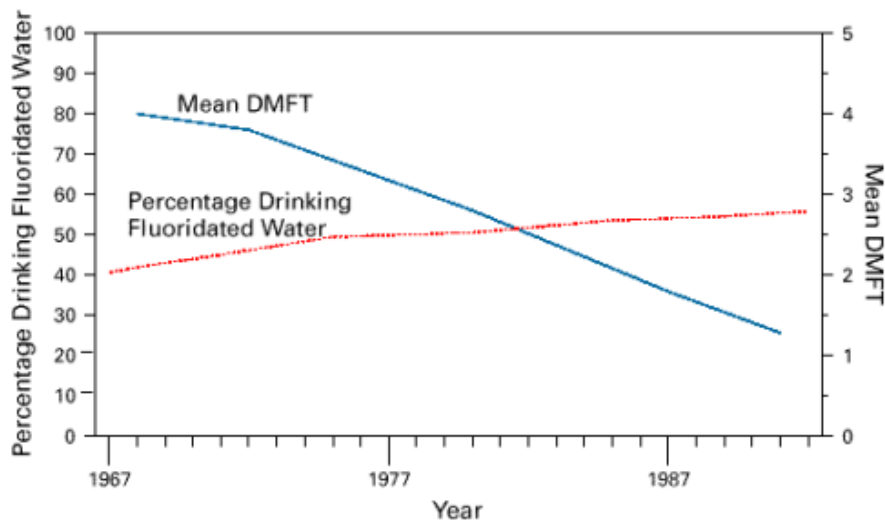
“Bone can ACCUMULATE up to 2500 ppm fluoride with fluoridation (we showed that in our Toronto vs Montreal study). The osteoclast cells are exposed to these huge concentrations (because they dissolve bone keeping the dissolved mineral under their dorsal surface through the use of hemidesmosome attachments and then they release that dissolved mineral into the bone extracellular fluid where nearby osteoblasts can also be exposed). In fact one of the theories why there is apoptosis of osteoclasts is the poisonous conditions they have to endure remodeling bone. It is also the reason there is a biologically-supported rationale for the bone cancer inducing effects of fluoride (personal correspondence, Nov 1, 2013).”

Now I will attempt to respond to some of the issues that Ken did comment on.

25) I agree with Ken that I was a little hasty in dismissing the Irish data comparing tooth decay in the Republic of Ireland and Northern Ireland. However, the **larger point** I was making was this: if indeed it is legitimate to compare these two populations (and there are both cultural and genetic differences) then the more urgent need is to compare the status of various health concerns – which may or may not be caused by or exacerbated by fluoride – between the two countries. However, even though fluoridation has been mandatory in the Republic since 1963, the health authorities there have not attempted a single study comparing the health of communities which are fluoridated and non-fluoridated, either within the Republic itself or between the Republic and the North. Like most fluoridated countries (including NZ) they are flying blind on health concerns.

26) I think the value of comparing tooth decay between countries is to note that tooth decay rates have been coming down in both fluoridated and non-fluoridated countries at similar rates. Avid promoters of fluoridation such as the Oral Health Division of the CDC often forget this and try to claim that fluoridation has been coming down in fluoridated countries *because of fluoridation* when similar declines have occurred in non-fluoridated countries over the same period. See the CDC's ridiculous Figure 1 in CDC (1999), (see figure below) which purports to show that tooth decay in 12-year olds has come down in the US over the period 1960s to the 1990s *because* over the same period the percentage of the US population drinking fluoridated water has increased!

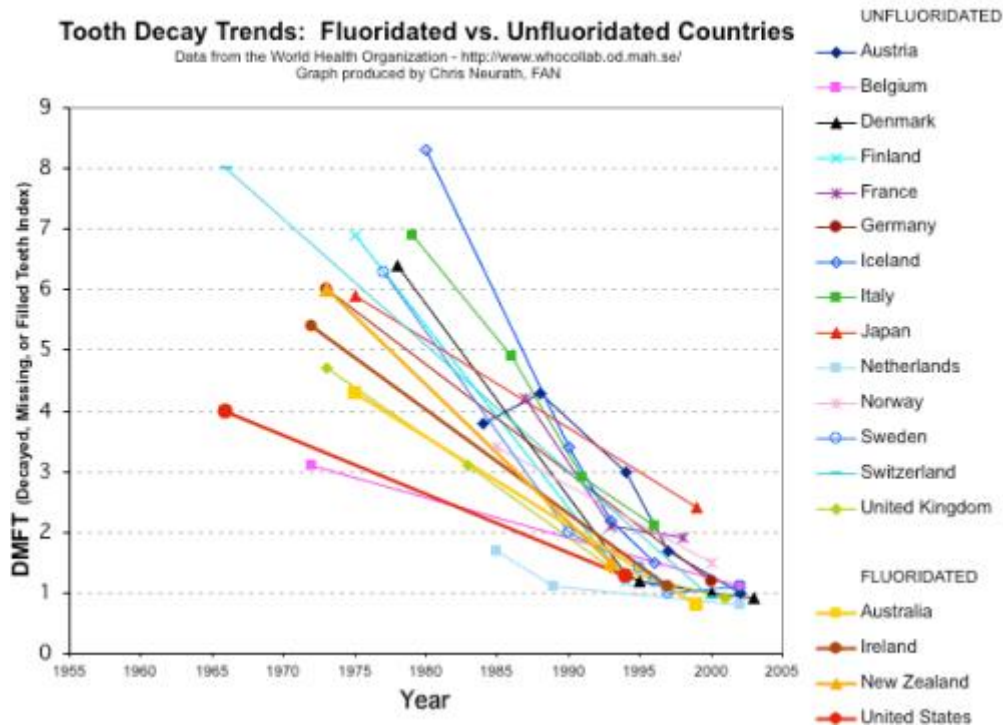
FIGURE 1. Percentage of population residing in areas with fluoridated community water systems and mean number of decayed, missing (because of caries), or filled permanent teeth (DMFT) among children aged 12 years — United States, 1967–1992



Sources:

1. CDC. Fluoridation census 1992. Atlanta, Georgia: US Department of Health and Human Services, Public Health Service, CDC, National Center for Prevention Services, Division of Oral Health, 1993.
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5. CDC, unpublished data, third National Health and Nutrition Examination Survey, 1988–1994.

I urge readers to compare this CDC figure with the figure summarizing the decline in tooth decay in many different countries – both fluoridated and non-fluoridated countries – covering the same period (and beyond) cited by the CDC.



27) I agree with Ken that whenever we cite the CDC (1999) statement that fluoride's predominant mode of action is topical not systemic we should not omit the word *predominant*. I usually do this. He found one example when I didn't.

28) I have conceded in another post that I was wrong in suggesting that Ken believed that the delivery of fluoride's topical effect was via the saliva generated in the salivary gland. However, if Ken rules out a significant role for the fluoride delivered by the salivary gland, and instead that the topical action is delivered directly in the mouth, why are we forcing people to *swallow* fluoridated water at all? Especially adults where no tooth development is involved once their teeth have erupted? Why instead, is he not merely advocating swishing and spitting out fluoridated water, or fluoridated mouthwash or using fluoridated toothpaste.

30) In challenging Ken's notion that the only animal studies we quoted had very high fluoride levels. I responded that it was well known that you needed to treat rats with 5 to 10 times as much fluoride to reach the same plasma levels as humans. Ken responded by pointing out he could find only one reference to this and cited the NRC (2006) commentary on Dunipace's work (Dunipace, 1995). The NRC characterized Dunipace's conclusion as showing that "rats require about five times greater water concentrations than humans to reach the same plasma concentration." (Appendix D, p. 442). However, there are several other studies that have suggested the same or even a higher ratio than 5 is needed.

Sawan (2010) explains why he used 100 ppm in his animal experiment as follows:

“However, while the fluoride concentration used in the present could be considered relatively high for rodents (100 mg/L or ppm), this concentration was chosen because it produces plasma fluoride levels that are comparable with those commonly found in humans chronically exposed to 8mg/L of fluoride in the drinking water, which is a concentration known to cause severe fluorosis.”

That is a ratio of 12.5.

Also Angmar-Månsson and Whitford (1982) pointed out to produce enamel fluorosis in rats one needed a concentration of 10 to 25 ppm fluoride (compared to the 2 ppm needed in humans). So that means you need a ratio of 5 to 10+ more fluoride to get the same result in rats as humans. Here is the quote:

“It is well known that, in fluoridated drinking water studies with rats, a water fluoride concentration of 10 – 25 ppm is necessary to produce minimal disturbances in enamel mineralization. Because of the higher water concentrations required, the rat has been regarded as more resistant to this adverse effect of fluoride. However, when the associated plasma levels are considered, the rat and the human appear to develop enamel fluorosis at very nearly the same fluoride concentrations.”

I would also point out that, in addition to the extra amount needed to reach the same plasma levels in humans, the NRC pointed out in their 2006 report that rats need at least 10 times more fluoride than humans to reach the same bone fluoride levels. To quote:

”...values support a rat-to-human conversion factor for bone fluoride uptake of at least an order of magnitude.” (Appendix D, p. 445)

Dr. J. William Hirzy.

31) Ken uses dentist Steve Slott to categorize Dr. Hirzy in the following manner, “Hirzy is a *long time avowed antifuoridationist and is employed by Connett as the paid lobbyist for Connett’s antifuoridationist group, FAN.*”

Clearly this comment from Slott, “an avowed profluoridationist,” is meant to throw doubt on the credentials and integrity of my colleague Bill Hirzy. I have known Bill for over 15 years. I first met him when he was working at the US EPA. At that time he and other professionals at the EPA were very concerned about the way that administrators in this agency felt that it was OK to force professionals to “bend their science and their statements” to fit into their policy judgments.

This concern began in 1985 when a scientist at the EPA admitted that he had been forced to go along with a determination that the safe MCL for fluoride was 4 ppm, when he knew that this level wasn’t safe. This professional and others at the EPA knew that the administrators were bowing to political pressure from politicians (e.g. Strom Thurmond) in certain states with areas of high natural fluoride and who were concerned that if a lower level was set for the MCL it would cost their states a lot of money to remove the fluoride.

As a result of this Dr Robert Carton and others set up a union at the EPA headquarters in an attempt to get a code of scientific integrity adopted at the EPA. This would forbid administrative staff from forcing scientists to make false statements about their scientific findings in order to fit into the “policy” of administrators. This same union after examining the scientific evidence came out in strong opposition to the so-called safety of the MCL and the MCLG for fluoride, both of which had been set at 4 ppm, and also the practice of water fluoridation.

Those who are interested can view Dr. Hirzy’s statement before a Senate subcommittee in the US Congress in 2000 (<http://fluoridealert.org/fan-tv/hirzy/>). Clearly, Bill’s opposition to fluoridation is science-based. Moreover, in a democracy like the US, like any other citizen, including Steve Slott, he is entitled to his opinion on a public policy issue like this, without being treated like some paid hack.

When Bill retired from his teaching position, Fluoride Action Network was only too happy to have such a qualified person work as our point person in Washington, DC. We have paid him a nominal salary to do this. That shouldn’t be used to suggest that he has somehow thrown science and his integrity out of the window, which I think Slott meant to imply when he says Bill is a “*paid lobbyist for Connett’s antifuoridationist group, FAN.*” Based on the science Bill is opposed to fluoridation. Based on the science FAN is opposed to fluoridation. It is a shame that Slott should think – or intimate – otherwise.

As far as lobbyists are concerned I think Steve would do better to wonder what the ADA is doing with 20 paid staff in DC, all of which are receiving a remuneration, which makes Bill’s nominal salary look like a pittance. One of the things that ADA is doing with its \$100 million budget is to try to persuade Congress and state health departments not to allow dental therapists to perform basic dental procedures in low-income areas. Ironically, I believe that Steve is against the ADA’s position on this sensible and cost-effective measure. It has proved most successful in NZ.

In my view Bill Hirzy is an excellent educator on this and other issues. We believe that he can help with a lot of education in Washington, DC, not just with legislators but with the city council and with environmental and other public interest groups. A lot of people in DC respect both his experience and his integrity.

Here is the link to Bill’s correction of the errors in his arsenic paper:

http://ac.els-cdn.com/S1462901113002451/1-s2.0-S1462901113002451-main.pdf?_tid=a7818160-5ddf-11e3-82c3-00000aacb35f&acdnat=1386270272_3d415310b2d50519720c64654969cc56

32) Finally, I attach Dr. Hirzy’s response to Ken’s comments on his input in part 3 of this thread:

In a paragraph headed in bold type Perrott cites my activism as reason to question my ability to properly assess risks. I freely admit making an error (soon to be rectified by publication of a corrigendum) in the annual cancer incidences for HFSA and pharmaceutical sodium

fluoride. That said, nevertheless EPA did not find fault in my determination that HFSA causes about 100 times more cancer than pharmaceutical sodium fluoride. Neither does Perrott show any fault in that determination.

Perrott comments about my dismissal of NSF's statement about their testing allegedly proving the amount of arsenic contributed by HFSA is non-detectable and perfectly safe, but he fails to address my observation that NSF in fact reports measurable amounts of arsenic contributed by treatment chemicals, and that those levels lead to 200 times higher cancer risk than USP NaF. In a debate one should address points raised by one's opponent – if one can....

After doing some calculations based on the New Zealand Specific Impurity Limit for arsenic, I do admit that the New Zealand standard is superior by a factor of 2.4 to that of NSF. That is, however, faint praise in that it allows about 500 fold higher lung/bladder cancer incidence than pharmaceutical grade sodium fluoride. See below.

Regarding the arsenic levels in HFSA and Mr. Perrott's being "suspicious" about my results and whether the HFSA samples I reported on were representative, Mr. Perrott cites the Brown et al. 2004 publication in the Journal of the American Water Works Association and kindly provided a link to the article. If he had read that article closely he would have noticed the support for my work on page 118. At page 118 of that piece, Brown et al. report testing 4 samples of HFSA, rejecting one because of excessive free HF, and finding arsenic levels of 9, 20 and 47 mg/kg, in the other three samples, all of which values fall within the range of the 33 samples I cited in my statistical analysis of arsenic levels in HFSA. Further on page 118, Brown et al. cite results from Weng et al. reporting on an unstated number of HFSA samples, finding an average of 28 mg/L and a maximum of 60 mg/L of arsenic – again within the range of my analysis. Finally, also on page 118 is citation of work by Casale, who found a range of 9.4 to 58.5 mg/L of arsenic – within the range of my analysis.

Concerning activism and suspicion, perhaps Perrott is correct in asserting that higher purity HFSA is available in New Zealand, but his activism in promoting fluoridation could raise parallel suspicion about that.

Perrott dismisses as "a silly conspiracy theory" my recitation of data published by the U.S. Geological Survey (USGS) showing that 94% of the byproduct HFSA produced by phosphate manufacturers in 2011 was sold to water fluoridation systems, and coupled with solid data on sales prices, produced about \$560,000,000 in revenues for those companies. If only 6% of HFSA found alternative markets, which USGS found to be valued by the producers at nearly double the value for the fluoridation market, where else would HFSA go than down our shower drains and toilets, etc. Pretty good business model for a "silly conspiracy" I'd say. My citation of the violation in Wellington, Florida was the only one I knew about. How many more there may be/have been, who can tell? And why are HFSA producers not routinely supplying certificates of analysis for every batch sold rather than simply stating "Complies with NSF/ANSI Standard 60."

What New Zealand Might Otherwise Do (Based in part on Standard for the Supply of Fluoride for Use in Water Treatment – Second Edition. New Zealand Water Supply and Disposal Association. 1997)

Assume density of 20% assay HFSA is 1.2 g/mL (density of 24% assay is 1.24g/mL).

Pure HFSA is 79% w/w fluoride

1 mL of HFSA x 1.2 g/mL x 0.20 x .79 = 0.190 g F/mL HFSA = 190 mg F/mL HFSA

Assume need to add 0.50 mg F/L H₂O

0.50 mg F/L H₂O ÷ 190 mg F/mL HFSA = 2.6 x 10⁻³ mL HFSA/L H₂O

2.6 x 10⁻³ mL HFSA/L H₂O x 1.2 g HFSA/mL HFSA = 3.2 x 10⁻³ g HFSA = 3.2 x 10⁻⁶ kg HFSA/L H₂O

SIL for As = 132 mg As/kg HFSA

$1.32 \times 10^2 \text{ mg As/kg HFSA} \times 3.2 \times 10^{-6} \text{ kg HFSA/L H}_2\text{O} = 4.2 \times 10^{-4} \text{ mg As/L} = 0.42 \text{ ug As/L}$

Using the USEPA modified population Unit Risk value of $3.5 \times 10^{-5}/(\text{ug As/L})$, a risk for lung/bladder cancer of 1.5×10^{-5} obtains. This is equivalent to 15 extra cancers per million population exposed for 70 years.

If 4 million people have been exposed at this level for 20 years, one would expect about 17 extra cancers to have developed.\

New Zealand's SIL for arsenic is about 2.4 times more protective than the U.S. standard.

If pharmaceutical grade NaF had been used for this same period, delivering 0.00084 ug As/L, then New Zealand's 4 million people exposed for 20 years may have developed about 0.03 such cancers.

If the New Zealand government were to have provided 4 million people with 2 L/day of water containing 0.50 mg added fluoride from pharmaceutical grade NaF for 20 years (and it is very likely that far fewer than 4 million would have opted to drink that water), it would have spend, in constant 2001 U.S. dollars, about \$190,000.

If HFSA had been purchased at about half the price charged in the U.S., i.e \$800/metric ton over that same period, and assuming New Zealanders use half as much water per capita as U.S. citizens, i.e. 50 U.S. gallons/day, and this practice ran for 20 years, then about \$6,000,000 would have gone to phosphate producers.

And assuming it costs half as much in New Zealand to treat the cancers HFSA's arsenic load produced, then an additional \$30,000,000 would be spent on medical costs.\

So, if you are really determined to offer fluoridated drinking water to New Zealanders, you would be well advised to consider the substantial cost savings you would realize by providing free containers of water fluoridated with pharmaceutical grade NaF just to those who want it, while acceding to the demands of your citizens who most vehemently do not want fluoride in their drinking water.\

And, by the way, the New Zealand Lung and Bladder Cancer/Fluoridation Lottery could be cancelled too.

Postscript. This will be my last contribution to this thread. I feel that I have presented my case fully in the book I co-authored (The Case Against Fluoride...). What I am more interested in now – having outlined some basic arguments against fluoridation in this thread (few of which have been satisfactorily rebutted) – is seeing what scientific case Ken can produce for fluoridation. This is meant to be the substance of the other thread and that is where I will now focus my efforts.

In this respect I have been disappointed in Ken's ability – after four attempts to do so – including the last instalment that he published yesterday (Dec 10) – to lay out a scientific case. So far Ken seems more adept at theorizing on why drinking fluoride should work rather than providing the studies that it actually does. In addition, he spends more time demonstrating his disdain for anyone opposed to fluoridation than actually producing the science which shows that fluoridation is “safe and effective” as proponents repeatedly claim. Finding fault with me or other opponents does not establish a case FOR fluoridation. It is a practice forced on millions of people that don't want it. He defends this practice and as such it his obligation to present a scientific case FOR fluoridation and I am still hoping that he will do that.

Let me be more specific: what I had hoped to see by now is:

a) What primary scientific research Ken has read that gives him the confidence that the epidemiological evidence is overwhelmingly in favor of fluoridation providing a significant benefit over and above the use of fluoridated toothpaste.

- b) What his response is to the latest news from Scotland that a simple and cost-effective strategy has been devised that has been found to combat tooth decay in low-income children which does not involve forcing people to swallow fluoride who don't want to.
- c) A presentation of a weight of evidence analysis that would allow him and other promoters to dismiss all the concerns I have raised about fluoride's impact on the brain and several other tissues. We have presented this case in our book and again in both these threads. Our case is in black and white and documented, where is his response in black and white and documented?

In the process of doing this I would particularly would like to see him identify papers that have been conducted in NZ (or Australia for that matter), which have examined any of the health issues discussed in our book, or that have collected fluoride exposure levels in the urine, blood or bones of NZ citizens to gauge their exposure to fluoride both in the short-term or long-term. In other words I am anxious to find out:

- a) the scientific basis for his confidence in the safety of water fluoridation;
- b) the argument he would raise to support the notion – despite so many unknowns – that the practice does not violate the Precautionary Principle (see chapter 20 in our book and Tickner and Coffin, 2006), and
- c) the basis for his confidence that there is an adequate margin of safety (see chapter 21 in our book) to protect everyone in a large population drinking fluoridated water – especially the most vulnerable – from any harmful effect.

I will continue to pursue his response to these challenges in the other thread: **Ken's Arguments For Fluoridation.**

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Ken Perrott- December 16, 2013

Paul's last article was another Gish gallop of arguments and questions he demands I answer. I discussed the use of the Gish gallop as a tactic for avoidance in my last article. In this article Paul demonstrates how the Gish gallop enables the user to also claim their discussion partner is "ducking" issues and "didn't address," "didn't acknowledge," "didn't comment on" or "didn't respond to" issues he has raised.

Again, I will not walk into that debating trap and mechanically go through his 30 numbered arguments but will attempt to accommodate as much as is reasonable with some general comments and some specific replies.

Activism and science

This year the fluoridation issue raised questions about the problems of activism for a number of New Zealand scientists. The local scientific community was taken by surprise when the Hamilton City Council in June this year voted to end fluoridation. Surprised because most of us were unaware that the council had decided not to go ahead with a referendum (as we had expected) and instead use a "tribunal" process of consultation. This approach suits activist groups very well. They can be continuously in touch with council decisions, have a membership or contact base that can be organised rapidly and they can saturate such a consultation process with their own submissions.

The Fluoride Action Network of NZ (FANNZ) did this very well. They were able to dominate the consultation process with 89% of the total submissions. (This in a city where referenda have shown about 70% support fluoridation). Being part of Paul Connett's Fluoride Alert Network they did this on an international scale – about 30% of their submissions were from outside Hamilton with many from outside New Zealand. People like Paul Connett and Declan Waugh made video submissions. These people were promoted as "international experts" or "world experts" on the subject even though they have no credible scientific publications on the subject. Of course local councillors did not have the background to see through that ruse. Reports prepared by the council staff showed the number and international origins of these submissions impressed the council and its bureaucracy.

It was easy to conclude that what local scientists lacked was a similar organised activist group. If not specifically devoted to defending the science behind fluoridation then at least to defending science in general. After all, anti-fluoridation activity is not the only area where science gets challenged.

Scientists and health professionals did become active in social communication activity, Facebook, letters to the editor, etc., but I noticed a distinct lack of enthusiasm for any organised activism. No one rushed to form an activist group.

Scientists have a problem with activism because the group thinking and selective use of scientific information inevitably involved is in direct conflict with the scientific ethos. That is why activist scientists tend to face disapproval from colleagues, although this has changed a

little recently where the vicious personal attacks on individual climate scientists has made some form of scientific activism essential.

Confirmation bias and activism

Contrary to what many people believe humans are not naturally a rational species. Despite their intelligence and ability to reason they are in practice driven primarily by instinct and emotions. In fact, they would have long become extinct if they relied completely and in all cases on the inefficient and slow process of rationally considering every event that required a response.

This means that confirmation bias and cherry picking information come naturally to us. It is normal to seek information which supports the preconceived ideas and theories we are emotionally attached to. Scientists are just as prone to these human failings as others but the scientific processes help reduce this problem. Scientific ideas and hypotheses are tested by experiential evidence – they are compared against the real world. Theories are judged on their evidential support and not their attractiveness. (This does not deny an important role for speculation). Ideas and theories are exposed to harsh critical consideration by colleagues. All this helps to encourage objectivity and reliability of scientific information – while not denying that there are still inevitable residual problems from confirmation bias. The dynamic nature of science and the provisional nature of current theories and ideas, means that over time mistakes arising from these human frailties can be reduced.

Contrast that with the position of activists, even scientific activists. They are inevitably driven by strong ideological or political aims which naturally encourage confirmation bias and cherry picking. But unlike a scientific researcher they exist in an uncritical, or at least biased, social environment. Group thinking encourages a selective approach to scientific knowledge and a resistance to considering anything conflicting with the activist agenda. While heretics can be encouraged in scientific research they get jumped on in activist groups. Ideas and messages do not get tested against reality – far from it. They are tested for political effectiveness, in the political arena – not the natural world.

In effect, the world of activism is stifling for a person used to the creativity of genuine scientific research. I recognise that at times activism is essential and have myself played an activist role in my past. Now I see it as a necessary evil but not something I could do as a job. I do not envy Paul Connett his job as an executive for an activist organisation. The environment of group thinking and the need to abandon intellectual honesty to the ideological aims of the group are bad enough. But what happens to a scientist in such a position who finds they can no longer follow the “party line?” That they no longer “have the faith?” It is a bit like the priest who finds, after years in the job, they are an atheist. Do they go on hypocritically preaching every Sunday or do they take the honest way out and abandon their job with its financial and social security to face an uncertain future?

In scientific research it is expected that we can change our beliefs and ideas in the face of new evidence. Not to do so could lead to loss of scientific prestige and employability. It is the reverse to what Paul would face if he lost his anti-fluoridation convictions.

That is the problem for me – the strong pressure to conform to the activist ideological agenda despite the evidence. I think that colours Paul’s approach to many of the issues in his articles here.

Misleading propaganda

Paul raises the misleading image that was in a Queensland Health brochure again. He sweats blood attempting to imply my approval of that tactic. That is not honest. Especially as I made clear that *“I do not support its implied message.”* And explained that Paul’s Queensland Health example, and a similar anti-fluoridation brochure I raised, are *“extreme exaggerations used to promote a message. Reasonable people should condemn that tactic.”*

It is interesting Paul devotes so much time on this brochure in his last contribution to what, after all, is meant to be a scientific exchange, not an exercise in laying guilt for someone else’s transgression. No one is actually defending the Queensland Health brochure – even Queensland Health! At this stage it seems purely to be a plaything of the anti-fluoridation groups. Paul himself was unable to supply a source or citation yet he had ready access to it and promotes it far and wide.

Don’t know what else I can add – except writing personally to Queensland Health with a complaint. Bit difficult without a citation to its use I could quote. Never mind, my public admonishment here should suffice.

I agree with Paul that we should expect better from our public servants but Paul missed my point *“This sort of misrepresentation is probably more common among opponents of fluoridation.”* I certainly find misrepresentation by public officials on this subject rare – anti-fluoride activists make this charge far more often than is justified.

I do not buy Paul’s argument that similar but much more common misinformative propaganda by anti-fluoridation activists is somehow more permissible than the rare piece by a public servant. Especially as we have the power to correct a public servant, submit a freedom of information application, get a retraction and an apology. But try that with anti-fluoride activists and organisations like FAN and FANNZ. No such luck. One is more likely to be abused.

Paul’s complaints in this area would be a bit more convincing if he publicly condemned the misleading propaganda from his own activists. He cannot be unaware of the extreme claims made by members of his Fluoride Alert Network throughout the world. Quite apart from their misrepresentation of the science, which he probably encourages anyway, there are the political and personal harassment of people by sections of his activist network which he cannot be blind to, yet refuses to condemn.

I have yet to see him condemn the atrocious propaganda, lies and personal attacks of propagandists like Alex Jones and Vinny Eastwood. It is not enough to say he doesn't necessarily support all their positions. The fact that he uses their services, and they use his, makes such weak dissociation disingenuous.

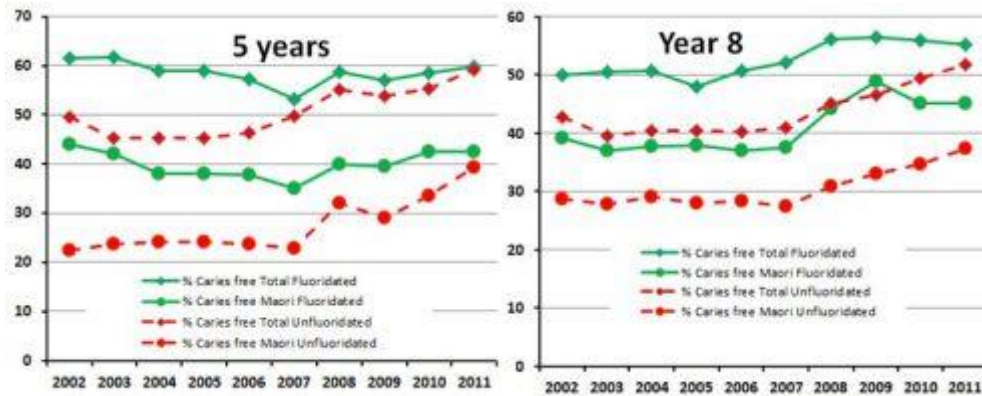
Why is he unwilling to publicly condemn such behaviour?

The Hastings trial

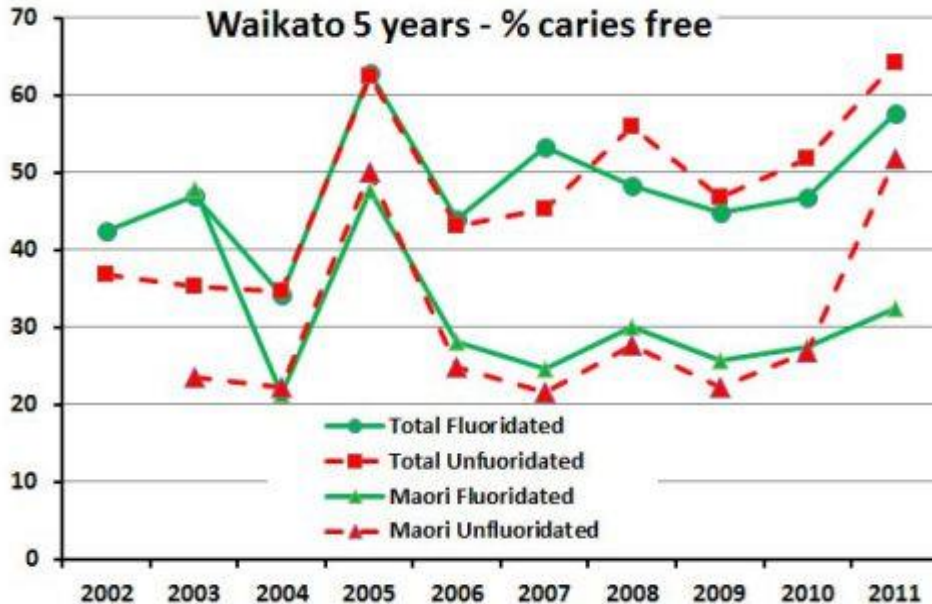
Paul weaves a conspiracy theory around the Hastings' trial using on one-sided sources and their vague claims. I note that Paul also relies on quotes from letters. He does the same in his book. A colleague analysed the reference list and found many are to newspapers, magazines, newsletters, letters and conversations in meetings (a large proportion are duplicates) (see *an impressive-sounding number of references, (therefore good?)*). Yet he proudly says "*You will note that every argument in this book is backed up with references to the scientific literature – 80 pages in all.*"

I don't think such vague charges should be the subject of our scientific exchange – especially as they divert attention from the scientific issues involved in planning and interpreting such trials and epidemiological studies. Paul should have looked at the disputes around Colqhoun's analysis of the New Zealand data. Colqhoun was strongly criticised for reliance on questionable data, crude measurements of caries prevalence and failing to establish residence histories and therefore reliable measures of fluoride intake (see, for example, Newbrun & Horowitz, 2002). He also placed far more reliance on longitudinal studies than is warranted and was selective in choosing studies which have compared fluoridated and unfluoridated communities.

I looked at the current NZ data, which are similar to that analysed by Colqhoun, in my article *Cherry picking fluoridation data*. This illustrates a number of things. The national data shows clear differences between children from fluoridated and unfluoridated communities and an ethnic effect attributed to social and economic deprivation. This is just normal school clinic data, without technique standardisation for those making the measurements or proper recording of place of residence. The latter effect probably shows up more strongly after 2004 when a "hub and spoke" dental clinics system was introduced further confusing proper records of likely fluoride intake because one clinic could serve a number of areas – both fluoridated and non-fluoridated. This is a likely explanation for the apparent decline of the effectiveness of fluoridation after 2006.



To illustrate how easy it is to extract data for regions and cities which give meaningless results the plot below shows the data for the Waikato. Clearly the variability in this data, (indicated by abrupt changes year to year) is so large it make interpretation meaningless. Yet this does not stop FANNZ, the local version of Paul's activist organisation, from hypocritically using just the 2011 data for the Waikato (where by chance children from fluoridated areas show more caries than unfluoridated!). One of their representative end used my graph below, showing the problem of cherry picking, as "proof" for claiming fluoridation increases incidence if caries. During the recent referendum campaigns this misrepresentation by anti-fluoridation activists was rife – yet they consistently ignored or covered up the national data.



There is a lesson in this. Careful and critical analysis of epidemiological data is necessary when considering such data. Effects of technique standardisation and changes, places of residence, mobility of families and diffusion of products from fluoridated into non-fluoridated areas must be considered.

Too often anti-fluoride activists simply select the data that fits their story better. They may even be unaware of what they are doing because confirmation bias is a trap we can all fall

into and it can be very tempting if one is simply looking for plots to illustrate an effect. To be fair, I have even seen proponents of fluoridation fall into this trap occasionally.

Margin of safety

Paul mentions margin of safety a lot. He claims that I did not comment on the margin of safety analysis he provided based on the Xiang et al. (2003a,b) study.

Has he not been reading my side of the exchange?

I had put a question to him on his use of this study to determine a margin of safety. After commenting on the quality of the study and the journal *Fluoride* where it was published I wrote:

Yet Paul uses Xiang's paper to authoritatively claim it had "found a threshold at 1.9 ppm for this effect." (What effect he refers to is unclear.) How reliable is that figure of 1.9 ppm (actually 1.85 or 2.32 ppm F in the paper) – considering the huge variation in the data points of the Figure 1? (Unfortunately the paper is not a lot of use in explaining that figure – reviewers should have paid more attention.)"

Paul did not respond so I article asking him *"about the huge variability in the data and how the hell one can place any confidence on the result drawn from Xiang's figure."*

Briefly my question related to the figure used by Xiang et al.

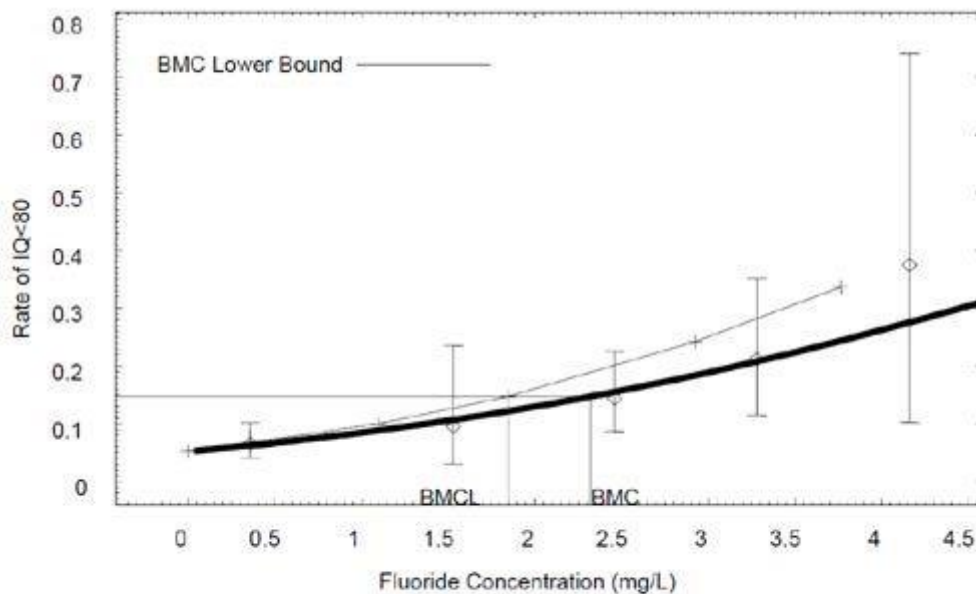


Figure 1. Concentration-response relationship between an IQ<80 score and the level of fluoride in drinking water

This is just another example Paul's selective use of the literature and selective interpretation of parts of it to justify a preconceived claim he wishes to make. In practice, safety limits and margins of safety must be based on a far more extensive review of the literature and involve far less hand waving than Paul demonstrates in this case.

Bottle fed babies – misinformation again

Several times Paul has raised the issue of bottle-fed infants without describing the problem. Broadly, he is making the common anti-fluoridation claim that the reliance of bottle-fed infants on formula made up with fluoridated water causes normal limits for maximum F intake to be exceeded. Usually activists using this argument will refer to health authorities which **they claim** recommend that formula not be made up using fluoridated water.

The science for the New Zealand situation is clearly described by Cressey et al (2009) in their report *Estimated Dietary Fluoride Intake For New Zealanders* by Peter Cressey, Dr Sally Gaw and Dr John Love. It is a straightforward desktop study of the “*dietary fluoride intakes for a range of age and gender sub-populations based on New Zealand data.*” This is how they described their findings for formula-fed infants:

“The estimates for a fully formula-fed infant exceeded the UL [upper level of intake] approximately one-third of the time for formula prepared with water at 0.7 mg fluoride/L and greater than 90% of the time for formula prepared with water at 1.0 mg fluoride/L. However, it should be noted that the current fluoride exposure estimates for formula-fed infants are based on scenarios consistent with regulatory guidelines, rather than on actual water fluoride concentrations and observed infant feeding practices..”

They conclude “*the very young appear to be the group at greatest risk of exceeding the UL.*” However:

“the rarity of moderate dental fluorosis in the Australia or New Zealand populations indicates that current exceedances do not constitute a safety concern, and indicates that the UL may need to be reviewed.”

They are conceding that in some cases, some of the time, recommended upper levels for fluoride intake can be exceeded for fully formula fed infants. However they do not see this as a real safety concern.

These conclusions lie behind the current advice from our Ministry of Health on this subject. This takes account of the need for review of current ULs and considers use of fluoridated water safe for fully formula-fed infants. However, they also recommend that if parents are concerned (such as over the risk of dental fluorosis) they should use non-fluoridated water for part of the feeding – a peace of mind matter.

The situation in the US is similar

American Dental Association advises:

Yes, it is safe to use fluoridated water to mix infant formula. If your baby is primarily fed infant formula, using fluoridated water might increase the chance for mild enamel fluorosis, but enamel fluorosis does not affect the health of your child or the health of your child’s teeth. Parents and caregivers are encouraged to talk to their dentists about what’s best for their child.”

Where parents want to reduce the risk of dental fluorosis they:

can use powdered or liquid concentrate formula mixed with water that either is fluoride-free or has low concentrations of fluoride.

And the CDC advises:

Yes, you can use fluoridated water for preparing infant formula. However, if your child is exclusively consuming infant formula reconstituted with fluoridated water, there may be an increased chance for mild dental fluorosis. To lessen this chance, parents can use low-fluoride bottled water some of the time to mix infant formula; these bottled waters are labelled as de-ionized, purified, demineralized, or distilled.

This sort of information is often distorted by anti-fluoridation activist propaganda. Very often they claim that authorities like the CDC are **recommending as an absolute** that parents use non-fluoridated water in preparing formula for infants, and not treat the issue as a peace of mind matter.

Dental fluorosis

Anti-fluoridation activists almost unanimously quote figures for total dental fluorosis (or its equivalent) lumping together everything from questionable to severe. This gives them a nice high figure to promote. But, as I have said before, they use a bait and switch tactic to exaggerate the seriousness of the problem by then considering only the more severe category's when considering the harm. It is worth actually listening to the anecdotal evidence of practicing dentists on this specific issue. How often do they see fluorosis or similar blemishes which need treatment? And how does this figure compare with the frequency with which they see dental decay serious enough to need treatment? I can think of only one dentist who claims fluorosis is a problem which he often sees and treats – he is an active propagandist for FANNZ. I have caught him telling many porkies about fluoridation and I wouldn't trust his claims.

Paul attempts to put words in my mouth saying I "*claimed there was practically no difference in dental fluorosis prevalence between fluoridated and non-fluoridated communities.*" I did point out that the most recent NZ Oral Health Survey found no measurable difference. But I also acknowledged that in general an increase in mild categories is normally observed with fluoridation. What I actually wrote was:

"the incidence of fluorosis for children living in fluoridated may often be the same as, or only slightly greater than, the incidence for children living in non-fluoridated areas."

This is not a denial of an increase in mild forms of fluorosis as a result of fluoridation. Nor is it a denial that the relatively small difference may reflect the diffusion of the benefits of fluoridation into the non-fluoridated areas through family mobility, poor representation of residence history and the movement of products prepared with fluoridated water.

Paul's misrepresentation is not the sort of behaviour I expect from a discussion partner in a scientific exchange.

All Paul's manipulation of figures and his claimed access to the minds and "*potential psychological problems for young teenagers*" does nothing to change the basic situation. This is that water fluoridation can cause an increase in the mildest classification of dental fluorosis but is generally not thought responsible for the more severe classifications. The latter are relatively rare and any increases over recent years is unusually attributed to the wider use of fluoridated toothpaste and fluoride dental office treatments (and their accidental ingestion).

The common anti-fluoridation propaganda gives the impression that the total fluoridation occurrence quoted is all severe and not almost all very mild or questionable. For example, in New Zealand activists often use the figure of 44% occurrence of dental fluorosis when only 2.5% is of any concern.

Selective quoting

I have said again and again that one should attempt to understand the scientific literature intelligently and critically. Hard to do as we all suffer from confirmation bias and can't help being selective. Fortunately working within a scientific community there is pressure from peers who will challenge ones interpretation. This helps encourage objectivity and honesty.

But working in an activist group one does not experience such challenges. If anything there is the challenge to conform with the group thought. Confirmation bias and cherry picking gets encouraged and rewarded. Paul's activism and bias is very clear in the way he selectively quotes the NRC (2006) report. Just a few examples from his last article in his attempt to justify conclusions he wishes to draw from animal studies using high fluoride concentrations.

*"Dunipace et al. (1995) concluded that rats require about five times greater water concentrations than humans to reach the same plasma concentration. **That factor appears uncertain, in part because the ratio can change with age or length of exposure. In addition, this approach compares water concentrations, not dose. Plasma levels can also vary considerably both between people and in the same person over time (Ekstrand 1978).**"*(My emphasis of the bits Paul omitted).

Similarly with Paul's second quote from the NRC report:

*"**Because many assumptions were involved in estimating the values presented in Table D-2, they should be used with caution. But values support a rat-to-human conversion factor for bone fluoride uptake of at least an order of magnitude.**"* (My emphasis of the bits Paul omitted)."

Natural and artificial fluoride

Many of people relying on Fluoride Alert for their information are confused about the nature of the hydrated fluoride anion in water. At the mystical end of this confusion is the concept

that chemical species derived from man-made process are different in their biological action to that from natural sources, even though chemically there is no difference. At the more “realistic” end there is a refusal to accept that the fluorosilicate anion decomposes on dilution. Then there is the hand waving over the role of calcium that Paul indulges in. He repeats his claim:

“Usually when fluoride occurs naturally in the water it is accompanied by large concentrations of ions like calcium. The presence of the calcium can reduce the uptake of fluoride in the stomach and GI tract. No such protection is offered when the fluoridating chemicals are added to soft water.”

I have had to repeatedly battle out this argument with anti-fluoridation activists who obviously don't understand basic chemistry but I find this statement amazing for a chemist who should understand the concept of solubility products and the nature of ions in solution.

Contrary to Paul's suggestion the relationship observed between natural Ca and F concentrations in groundwaters is usually inverse – F concentrations increase as Ca concentrations decrease and vice versa (see for example [Handa 1975](#) – *Geochemistry and Genesis of Fluoride-Containing Ground Waters in India*). Just what we expect when a solid phase like fluorite or apatite is determining solution concentrations at equilibrium.

Here is what one of the commenters on Paul's last article, Jo Lane, has to say about Paul's denial of the presence of Ca in treated fluoridated water:

“Point 20) Classic example of pseudoscience. Let's assume that Paul is correct in asserting that the presence of Ca²⁺ ions affects F- uptake in the GI tract.

Municipal water supplies in NZ have a target hardness (combined concentration of Ca²⁺ and Mg²⁺ ions) of 200 mg L⁻¹. Most of this is Ca²⁺ as Lime (CaO) is typically used to increase pH in one of the final stages of water treatment.

If water was fluoridated to 0.8 mg L⁻¹ F- (unreasonably assuming there is 0 mg L⁻¹ F- to start with) using CaF₂ as a source, the concentration of Ca²⁺ would increase by 0.2 % as compared to using HFA or NaF as a source of F-. This 0.2% change in Ca²⁺ concentration will not have any appreciable effect on F- uptake in the GI tract.

Given Paul has a PhD in chemistry I cannot believe that he is ignorant of such basic chemistry and so I am left with the unfortunate impression that he is being deliberately deceptive in the way that he presents his arguments.”

I agree. Sure, the Ca concentration in community water supplies will generally be lower than the target value (which is a maximum) but the principle remains. Replacement of fluorosilicic acid by fluorite (CaF₂) as a fluoridating agent would have a minuscule effect on calcium concentrations because there is plenty of calcium from other sources – even in soft water.

Paul's claim is the sort of thing that even an educated chemist might say if they are ideologically driven. This is the problem with activist groups with their own ideological

demands and group thinking. It is easy for even the trained person to fall in to an opportunist use of their speciality. And if, like Paul, they are working as an executive of an activist group they don't have anyone around them to challenge such distortions.

Irish data and reliance on inter-country comparisons

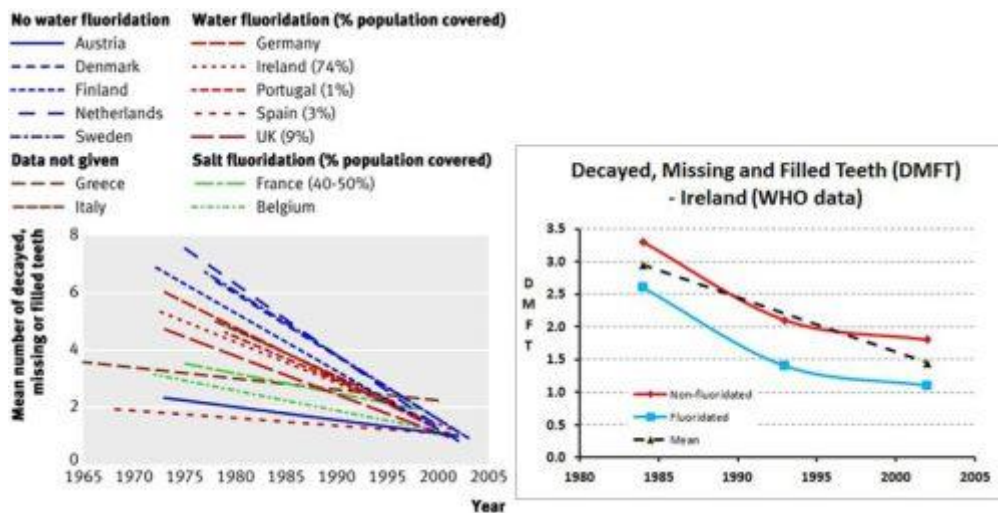
I am pleased Paul admits to being “hasty” in his dismissal of the Irish data. But there are two issues.

1: His problem was more than haste – I was objecting to his attempt to **belittle** the data by suggesting the Irish workers were biased. I expressed surprise that he would reject the data with that suggestion in a scientific exchange.

2: He appears confused – despite my clear explanation of the data I used. These were the same as used by Cheng et al (2007) – **for just one country (Ireland)** but separated into the fluoridated and unfluoridated areas – not just using the average that Cheng et al used). Paul describes the data as “*comparing tooth decay in the Republic of Ireland and Northern Ireland.*” Clearly it did not.

Perhaps Paul's fixation with Declan Waugh's discredited comparisons of the health statistics for the two countries was pro-occupying Paul's mind – or perhaps he wanted to divert the discussion into that area.

I repeat the comparison I used below.



The dotted line in the RH figure is effectively what Cheng et al (2007) used for Ireland in the LH figure.

At the time I explained the problems in making the inter-country comparisons Paul was insisting on:

“Simple comparison of countries obscures all sorts of effects such as differences in culture, history, social and political policies, etc. Such plots are also influenced by changes and differences in dental treatment and measurement techniques.”

However, as Paul raises the issue again it is worth commenting again on the flippant way he and other anti-fluoridation propagandists use inter-country comparisons like this. This is the hand-waving involved in claiming the data shows no effect of different fluoridation policies. I will use a figure from Paul’s book to illustrate the problem.

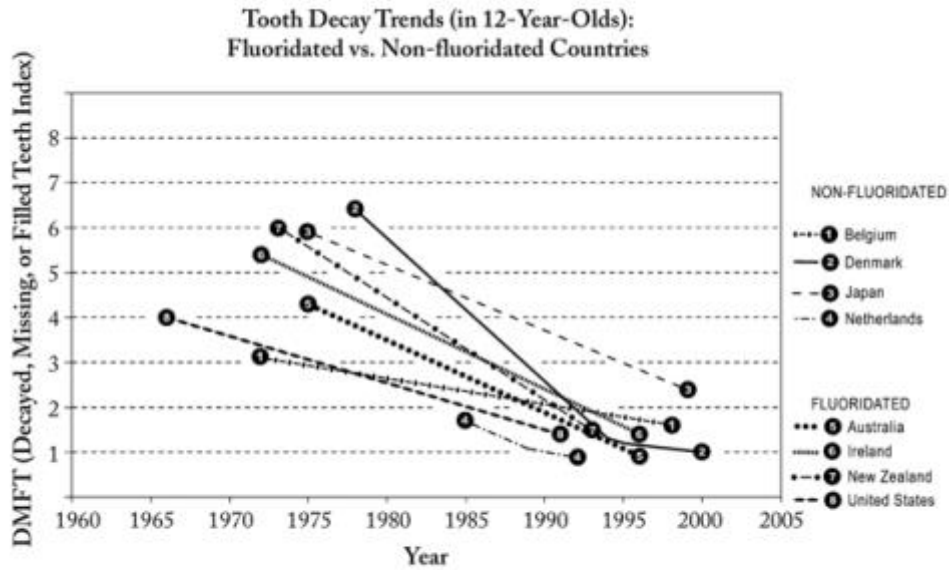


Figure 6.1. Tooth decay trends in twelve-year-olds in fluoridated vs. a representative sample of non-fluoridated countries. Graph based upon plots by Chris Neurath.⁸ *Source:* World Health Organization, 2004.

Paul claims his figure shows no difference between the countries – but did he do anything to check that? Did he actually measure the slopes for the different countries? Or did he just wave his hands and say there is clearly no difference?

Fortunately with so few countries it is relatively easy to compare the slopes. I have done so using the data from the WHO site and found the average decline was 0.17 DMFT/year for fluoridated countries and 0.13 DMFT/year for the non-fluoridated countries. This suggests the decline of DMFT in the fluoridated countries was about 25% greater than in the non-fluoridated countries.

Local anti-fluoridation activists reacted strongly to my analysis claiming it is obvious that the analysis is useless. I am sure Paul will point out that the figure of 25% will not be statistically significant – and I agree. The scatter in the rates of decline among the different countries is very large. On top of that the original data itself is hardly very good with generally only 2 data points for each country.

But if the variation is great enough to make a 25% difference in slopes non-significant then what value do such figures have for Paul's argument? Using simple hand waving and eye-balling to claim no difference is deceptive because he hides that variation. We just don't expect such comparisons to show the differences due to fluoridation policies. Variation and the influence of confounding factors have too great an influence.

Paul continues to ignore systemic role

Although he concedes it wrong to create the impression that the current surface or topical mechanism for the beneficial role of fluoridated water on existing teeth is the only mechanism he still persists in ignoring any role for ingested fluoride. Any systemic effect. He asks "*why are we forcing people to swallow fluoridated water at all?*" He ask why I am "*not merely advocating swishing and spitting out fluoridated water, or fluoridated mouthwash or using fluoridated toothpaste.*"

I have answered that question several times but Paul continues to ignore my response. He claims my description of the normal and natural role of fluoride in bioapatites do not get is anywhere. He ignores my reference to scientific reports of the participation of ingested fluoride in improving oral health, especially through its beneficial role before teeth erupt.

Unfortunately Paul cannot get past his emotive description of a social health policy as "forcing" something on people. His naive assertion that normal consumption of water should be replaced by "*swishing and spitting out*" or by a mouthwash or toothpaste also shows he just does not understand the nature of a social health policy. I discussed this in more detail in my last article.

Hirzy's conspiracy theory

Paul's colleague in FAN, Bill Hirzy, is unhappy about my reference to his use of a conspiracy theory – the claim that fluoridation is used as a way of disposing of industrial waste. I was referring to Bill's claim in his section of Paul's article:

"Water fluoridation, especially with FSA in the U.S., is not at all about improving dental health; it is rather about U.S. taxpayers paying phosphate producers billions of dollars for the privilege of having our public drinking water systems used to dispose of an acid that would otherwise have to be managed in a hazardous waste facility, and thereby improving the bottom lines of phosphate producers."

He defends himself by attempting a diversion into USGS data showing 94% of fluorosilicic acid produced as a byproduct by phosphate manufacturers goes to water fluoridation systems.

I don't doubt those figures. M. Michael Miller, in his article *Fluorspar* gives similar data for 2004:

"About 38,700 t of byproduct fluorosilicic acid valued at \$5.15 million was sold for water fluoridation, and about 1 2,300 t valued at \$2.71 million was sold or used for other uses"

Miller's 75% of byproduct fluorosilicic acid sold for water fluoridation is lower than the 94% Hirzy quotes but the difference could result from some of the material being converted to other products before sale.

So, if a quarter of byproduct fluorosilicic acid, or its conversion products, find markets other than water fluoridation what is it about this quarter which makes it a valuable, saleable product – while the 75% sold for water fluoridation must be classified as a waste product and need a conspiracy for its disposal?

Extensive possibilities for fluorosilicic acid uses

As mentioned above there is certainly a market for fluorosilicic acid, and its conversion products, apart from use as a water fluoridation agent. I believe that market will probably increase further because the decline in fluorite sources will increase the use of phosphate ores as a source of fluorine chemicals. This will mean that fluorosilicic acid will become more commonly used as an intermediate in the preparation of many, if not most, fluoride chemicals produced.

Currently fluorosilicic acid can be used in the tanning of animal hides and skins, oil well acidifying, electroplating, glass etching, as a commercial laundry sour, sterilising agent, in cement and wood preservatives, in the manufacture of ceramics, glasses and paints, in lead refining, etc. it can also be used to manufacture hydrofluoric acid, another important industrial chemical and intermediate for many other fluorine compounds. It can also be converted to aluminium fluoride and cryolite which are important in the conversion of alumina ores to aluminium metal.

Ultimately the fluorosilicic acid byproduct from the phosphate industry could become the Teflon on your frying pan, the refrigerant compound in your refrigerator or incorporated in the many products you use every day.

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Paul Connett - December 25, 2013

Ken's response to my last posting once again is incomplete and evasive. Let me review what has happened here.

Ken was asked to present the case FOR fluoridation. **After four attempts Ken has produced very little science to support such a case.** In part 6 of this thread I laid out what I felt would be the necessary components for such a scientific case and asked some very specific questions in the hope that Ken would present that case. Ken's response has been disappointing

Ken's response in part 7 of this thread

Apart from further discussion on the theoretical mechanism of fluoride's topical mechanism of action, a few citations on benefits, more criticisms of the opponents of fluoridation and more discussion on the ethical arguments Ken failed to present many primary scientific studies to support the case *for* fluoridation. Instead, he either ignored the questions I posed, was evasive or sought to obfuscate the key issues I presented. This meandering response may satisfy Ken's urge to demonstrate his general distaste for opponents of fluoridation in NZ (based on the emails I have received this distaste cuts both ways) but it does not advance his scientific case *for* fluoridation one iota.

Instead of making a serious or even good faith effort to address the scientific questions I posed he attempted to dismiss my whole effort by claiming that I was unfairly throwing the kitchen sink at him (my words). His own words were new to me. He described my series of specific questions as follows,

"It's a real Gish gallop – suddenly demanding answers about arthritis, kidney function, thyroid function, osteosarcoma, individual sensitivity to fluoride, menstruation, effect on babies, monitoring bone concentrations and finally, all or any health concerns in New Zealand. Without any background to any of the issues. (Wikipedia describes Gish gallopers as using 'a rapid-fire approach during a debate, presenting arguments and changing topics quickly')."

As far as Ken's claim that I have failed to present the background to my questions he is wrong on two counts. First, I have raised several of these issues before in one or both of our threads – **thus there is nothing sudden about many of these questions.** Second, plenty of background was laid down on all of the issues in our book *The Case Against Fluoride*, a pdf copy of which was sent to Ken over a month ago.

If Ken was more familiar with the literature he would have known that the response to each question I posed was not difficult at all.

One sentence on most of these questions would have sufficed, for the simple reason that incredibly NO (or very few) studies on these topics have been undertaken in NZ or other

fluoridated countries like Australia, Canada, Ireland, Israel, the US or the UK. More specifically:

1) There have been NO attempts to investigate arthritis rates in fluoridated communities in NZ or other fluoridated countries, even though it is known that the first symptoms of fluoride poisoning of the bone are identical to arthritic symptoms. I have given citations to some of these studies.

2) There have been NO attempts to investigate a possible relationship between fluoridation and an earlier onset of menstruation in young girls or puberty in boys in fluoridated communities in NZ or other fluoridated countries, even though there is some evidence that this maybe occurring (Schlesinger et al., 1956) as well as Luke's work on the pineal gland (Luke, 1997, 2001).

3) Neither NZ nor any other fluoridating country has attempted to investigate the issue that some individuals report increased sensitivity to fluoride even though independent observers (e.g. Taves, discussed in chapter 13 of our book) and one governmental organization (Australia's NHMRC, 1991) have recommended that this sensible measure be undertaken. Ken does not acknowledge this and misses the point by attacking the studies and numerous anecdotal reports that have waved "red flags" on this issue.

4) There have been NO systematic or comprehensive efforts by government health agencies to monitor the fluoride levels in the urine, blood or bones of any fluoridated community in NZ or any other fluoridated country. Australia's NHMRC in 1991 recommended bone levels be collected as a basis for epidemiological studies on fluoride's impact on the bone but no attempt has been made there in the 22 years that have elapsed since this recommendation was made; nor in NZ.

5) There has been NO published study refuting Bassin's finding of an age-related window of vulnerability (ages 6 through 8) for young boys being exposed to fluoridated water and succumbing to osteosarcoma. The promised study (Kim et al, 2011) miserably failed to refute this finding despite the promises made in 2006 that it would do so.

6) There has been little or no attempt to see if the current epidemic of hypothyroidism in NZ and other fluoridated countries has anything to do with exposure to fluoride even though doctors in Argentina, France and Germany used fluoride treatment to lower thyroid activity in hyperthyroid patients from the 1930s to the 1950s (See Galletti and Joyet, 1958).

7) There have been practically NO studies investigating possible health concerns in NZ possibly associated with fluoridation. Nor have there been attempts to reproduce studies that have found harm in countries with high natural fluoride levels. I was not aware of any studies in NZ other than a small IQ study from the 1980s but I thought it wise to find out if Ken knew of any. But he didn't respond. I also asked him if he felt the absence of study was the same as the absence of harm but again he didn't respond.

8) There have been a number of studies on teeth in NZ and other fluoridated communities as if this was the only tissue of concern in the baby's developing body or of concern for adults

with lifelong exposure. **Ken has still yet to discuss the wisdom – or otherwise – of exposing a bottle-fed baby to about 200 times the level of fluoride that nature intended** (0.7 ppm in fluoridated water versus 0.004 ppm in mothers' milk).

9) In short. **While the NZ government has poured over \$1 million into the NZ Fluoridation Information Service**, which is little more than a PR operation for fluoridation, they have taken little or no steps to fund any primary studies to see if this practice is harming anyone in NZ.

More Broad-brush dismissals

On the issue of fluoridation's effectiveness Ken attempts to use the same broad-brush dismissal of the citations I offered in support of my case that evidence for swallowing fluoride reduces tooth decay was very weak. Ken responded:

“So, I am not impressed by Connett's paragraph of about 30 unexplained citations – nor by a long reference list at the end of his article.”

I am baffled as to why he should describe these citations as “unexplained” when I made it clear that the citations were all discussed in three chapters of our book (chapters 6-8). Ken had already explained that he had read up to chapter 9 in our book so his claim that the citations are unexplained is rather sloppy. As far as the number of citations is concerned it would be more understandable if Ken was complaining about my giving *too few* citations, not too many!

I ask the reader to consider for a moment, which is more convincing – my extensive list of references to the literature which suggest the ineffectiveness of fluoridation *or the very sparse list of references* provided by Ken which he claims support the effectiveness of fluoridation. However, at least he gave *some* references here; he gave *none* on the health concerns I raised.

Instead of responding scientifically – or at least conceding that the science has not been undertaken – Ken chose to either ignore or obfuscate most of the scientific issues I raised in the following ways:

1) His response is very familiar. He chose to attack the messenger and ignore the message. From Ken's perspective there is nothing wrong with the practice and promotion of fluoridation – it is Paul Connett and other opponents of fluoridation who are the problem!

2) Really substantial issues I have raised are being ignored, in some cases for the second and even third time of asking. For example where are his comments on the

a) difference between dose and concentration;

b) the need for a margin of safety analysis when extrapolating from the doses that cause harm in animal and human studies and

c) the need for a weight of evidence approach to the scientific literature on this subject.

3) Where Ken does address an issue his response has often been evasive and clouded with obfuscation. For example see his response to my reasonable scientific request for a list of studies that negate or balance out (i.e. weight of evidence analysis) the long list of studies that indicate that fluoride can damage animal brain and interfere with human behavior and intellectual development. His response was to classify such a request as “the IQ gambit” and to bring up the **distraction** of “Hitler using fluoride to control prisoners” when he knows full well that I have disowned such claims in public and in writing. See for example, these quotes from our book:

“It is true that a few people who oppose fluoridation do so based on claims that Nazi Germany and other totalitarian regimes used it as a method of mind control. There is little evidence that would satisfy a historian to support such claims. The vast majority of fluoridation opponents repudiate such views and base their opposition on science and ethics.” (pp. 256-7)

and

“Two speculations we reject outright are that fluoridation is (1) some sinister plot to “dumb down” the population or (2) part of some worldwide plan to reduce the size of the global population.” (p.258)

4) Thus, Ken has still to present a substantial case FOR fluoridation based upon the citation of primary studies.

5) Unfortunately, he is leaving it to others to present some of his case in the comments section. I made it clear to Ken when we discussing the format of this debate that I was not interested in these kind of blog comments which become very personal and sometimes insulting. I thought we had agreed that this was going to be a scientific exchange between the two of us. I am not prepared to sift through the insulting chaff in the comments section to get to the scientific wheat.

Someone has forwarded to me a recent personal attack on me by Steve Slott, DDS:

Steve Slott / December 19, 2013 at 1:40 pm /

You got it Stuart. Sarah Palin epitomizes the anti-fluoridationist. Being totally oblivious to her own ignorance she just blusters along, totally bewildered as to why she gets no respect from the mainstream.

Forgive me for straying off topic, Ken, but the most frustrating thing about anti-fluoridationists is their ignorance, and their total oblivion to it. Somebody like Connett comes along with just enough education and charisma to come across as being an “authority” on the issue, yet totally lacking understanding of basic facts, far overestimating of his own knowledge, and convinces the blind followers who crave any and all anti-authoritarian causes, that the establishment is corrupt, ignorant, and lacks the “knowledge” that only he possesses through his “study” of new “emerging science “. Being totally unaware that what is “new science” to him is nothing more than basic knowledge of which

the true experts and authorities have long since been aware and have fully addressed, he blusters forward confident that he has the “truth” on his side. The worldwide body of respected healthcare is either “corrupt”, conspiracy laden, or ignorant of the “facts” that he is trying his utmost to bring to their attention. Dentists are running the fluoridation show, yet are all dumber than doorknobs and totally lacking in any knowledge of the human body outside of the portions of the teeth that are visible above the gum line, and decision makers are all unwittingly manipulated by big money interests. The people to whom he plays buy into his spiel, lock, stock, and barrel, thus becoming in their own minds far more knowledgeable about the issue than the dumb dentists, corrupt mainstream healthcare, and unwitting politicians who are stripping away personal freedoms and poisoning everyone in the process. Portland and Wichita are poster-children for the chaotic circus side-show that he creates by convincing a very active, very vocal, very ignorant few, of the “validity” of his own ignorance.

Steven D. Slott, DDS

Ken you are the moderator of the comments posted on your website, can you explain to me how this comment contributes to the science of this debate? Can you explain to me why you allow this kind of personal attack on your opponent – completely unrelated to any scientific argument that I have raised – to be part of the visible record on this matter? Just what purpose does it serve other than to muddy the waters and poison the minds of any independent observers? Surely such a posting has no place in a debate that is supposed to be about the **science** of this controversial issue.

Now I will address some of the issues on which Ken offered a response.

1) On Randomized control studies (RCT).

I complained that after 68 years no government promoting fluoridation has undertaken an RCT to demonstrate *effectiveness*. This is the gold standard in epidemiology. In response, Ken suggests that I should have done an RCT of my own!

As far as safety is concerned I agree that you cannot prove a negative, however such an argument neither explains nor excuses the lack of responsible attention to health concerns by fluoridating countries. The absence of study on many very important health concerns is inexcusable and cannot be explained away with rhetoric.

2. The ethical argument.

Ken claims that opponents of fluoridation merely focus on the violation of informed consent and ignore the social benefits of the program. However, that line of argument assumes that:

- a) such a benefit actually exists (and Ken hasn't presented much of a case for that yet);
- b) that very little – if any -risk is involved (Ken hasn't presented much primary evidence to support that);

c) that the benefits greatly exceed the risks (not possible unless Ken has produced a strong case for both a) and b) which he has not;

d) that there are no practical and cost effective alternative social strategies which avoid the violation of the individual's right to informed consent. In this respect it is very disappointing that Ken has yet to comment on the successful program being used in Scotland to fight tooth decay in children from low-income families there. Nor has he reviewed any of the other programs being used in the vast majority of European countries that don't force people to drink fluoridated tap water.

I would also hope that at some point Ken would address the Precautionary Principle as it applies to the ethics of this issue (see chapter 21, in *The Case Against Fluoride...*)

3) Does tooth decay go up when fluoridation is halted?

In two of the four studies I cited (from Cuba, former East Germany, Finland and British Columbia) where tooth decay did not go up when fluoridation was stopped, Ken says that other measures were taken in two of those communities (Cuba and former East Germany). That's a good point. However, it undermines his argument that water fluoridation is the only way to go as far as fighting tooth decay is concerned. If these communities have found alternative methods why aren't fluoridating governments studying these alternative methods? Again I refer to the successful and cost-effective program with children in low-income families in Scotland.

It is not clear if Ken believes that alternative methods were applied to explain the results in Finland and British Columbia.

In personal correspondence I have had with Rudolf Ziegelbecker, Jr., from Austria, who has studied this matter (and his father before him) for many years, he maintains that there has been no increases in tooth decay in any of the European countries that have stopped fluoridation. Is Ken aware of any evidence to the contrary?

4. Does fluoridated water deliver a significant topical benefit over and above that delivered by fluoridated toothpaste?

I notice that Ken twice *combines* discussion of fluoride's topical exposure via water *and* via *food*. He states:

*"So fluoride concentrations in saliva after drinking water **or** eating food containing fluoride can be quite variable."*

*"Fluoride concentrations in saliva and plaque do reach a maximum after drinking water **and** eating food containing fluoride..."*

This is interesting because it goes back to my original skepticism about drinking fluoridated water doing much of anything in the oral cavity before it goes down the gullet – that is unless one swishes. On the other hand I can understand that any fluoride present in food is going to be made readily available to both the tooth surfaces and the saliva during the chewing of food and therefore may participate in the theoretical mechanisms that Ken discusses.

If, in fact, this mode of delivery (i.e. via food) is the relevant one then Ken would do better either a) to recommend making fluoridated salt available to those who want it in NZ or b) recommend that parents tell their children to swish the fluoridated water in their mouths before they swallow it. But there we are back to education again, and that is something that Ken wishes to avoid. We are also back to the potential harm from swallowing fluoride.

Beyond theoretical mechanisms

Whatever the theoretical mechanism for fluoride's action (and I will leave it to the specialists in this field to fight that out), as a promoter of fluoridation, Ken still has to demonstrate that the *weight of evidence* from epidemiological studies indicates that there is a significant benefit from drinking fluoridated water over and above the use of fluoridated toothpaste. I don't think he has done that.

He has also yet to explain why it is in the *largest surveys* there appears to be little difference in tooth decay in the permanent teeth between fluoridated and non-fluoridated communities, states and countries (see chapter 6 in *The Case Against Fluoride...*), with the one possible exception of the comparison between the Republic of Ireland and Northern Ireland, that Ken has cited.

In short, in the majority of the large surveys the relationship between tooth decay and the presence or absence of fluoride in the drinking water does not appear to rise above background noise. However, the relationship between fluoride levels and dental fluorosis certainly does rise above background noise (see chapter 7 in *The Case Against Fluoride...*) as does the inverse relationship between tooth decay and income levels (see chapter 6 in *The Case Against Fluoride...*).

Nor has Ken addressed the fact that in the only study that has looked at tooth decay as a function of how much fluoride children were ingesting (from all sources) there was no significant relationship between the amount of fluoride ingested on a daily basis and the level of tooth decay (Warren et al, 2009).

Although the late Dr. David Locker was not opposed to water fluoridation, he did have the integrity to admit in the review of dental studies worldwide, which he performed for the Ontario government in 1999, that:

“The magnitude of [fluoridation’s] effect is not large in absolute terms, is often not statistically significant, and may not be of clinical significance.”

My final challenge to Ken.

Ken I have patiently tried to debate the scientific issues with you but apart from your interest in bioapatites and the theoretical mechanism of fluoride's actions (both interesting subjects but insufficient to demonstrate the wisdom of forced fluoridation) I believe that you have offered little in the way of science to support the case for fluoridation. Meanwhile, as moderator you are allowing insulting and personal attacks on me by people like Steve Slott to be posted as part of this exchange. I am happy to engage in a rational scientific exchange on this issue but not happy for it to be an excuse for an unscientific attack on my integrity.

I would like to extend you one more shot at demonstrating that there is convincing primary scientific evidence, which shows:

- 1) That the *weight of evidence* of the primary studies indicates that drinking fluoridated water provides a large and significant benefit to the permanent teeth.
- 2) That the *weight of evidence* of the primary studies indicates that there is an *adequate margin of safety* to protect *everyone* drinking fluoridated water and getting fluoride from other sources from damage to the developing brain documented in areas of moderate to high natural levels of fluoride. Note: that margin of safety should protect for the bottle-fed infant.
- 3) My preference would be for you to do the same with other health concerns that I have raised including those where we need to protect someone consuming uncontrolled quantities of fluoridated water over a whole lifetime – but if it simplifies matters for you, then for now I will settle for you just tackling the impacts on the brain (i.e. 2 above).
- 4) That the benefits you demonstrate in 1) outweigh the risks I have presented in my book and in these threads.

And that the case you present in 1-4 is so strong that it justifies:

- a) overriding the individual's right to informed consent to human treatment.
- b) overriding the Precautionary Principle
- c) ignoring the fact that there are alternative ways of fighting tooth decay which are universally available – and the successful programs that are reducing tooth decay in children from low-income families in countries like Scotland and most of the rest of Europe without forcing this practice on people who don't want it.

As far as the Scottish program is concerned we can add a few more bones to the BBC report I included earlier. This is how my colleague Dr. Bruce Spittle summarized the situation in Scotland:

Instead of water fluoridation, the newly devolved Scottish Government opted, in its 2005 dental action plan (their Childsmile program), to pursue:

- a) school-based toothbrushing schemes;

- b) the offering of healthy snacks and drinks to children;
- c) oral health advice to children and families on healthy weaning, diet, teething and toothbrushing;
- d) annual dental check-ups and treatment if required, and
- e) fluoride varnish applications (The Scottish Government, 2005; Macpherson LMD et al., 2010; Turner S et al., 2010; Chestnutt, 2013; Healthier Scotland, Scottish Government, 2013).

Encouraging results have been reported from this national dental programme with the proportion of children in Primary 1 (aged 4–6 years) without obvious dental decay rising from 42.3% in 1996 to 67% in 2012 (Information Services Division Scotland, 2012).

Similarly, the proportion of children in Primary 7 (aged 10–12 years) without obvious dental decay rose from 52.9% in 2005 to 69.4% in 2011 and 72.8% in 2013 (Information Services Division Scotland, 2013).

The introduction and uptake of nursery school toothbrushing is likely to have contributed to a large extent to the improved oral health in five-year-old Scottish children (Macpherson, 2013).

I know these are tough challenges but they are the kind of challenges that should have been tackled years ago by government agencies promoting the unusual (and I say unacceptable) practice of using the public water supply to deliver human treatment. But they weren't. But for those who continue to support this practice like you the tasks above have to be addressed.

If you are not prepared to attempt this challenge in good faith then I will end my participation in this exchange forthwith.

Paul Connett,

Dec 22, 2013

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Ken Perrott - 1 December 30, 2013

This exchange is now winding down – despite the fact we have not dealt properly with all the items on Paul’s original list. The exchange has become repetitive and personal. I think readers are becoming bored with this and would have preferred us to work through each item in turn **and move on**. Paul’s declaration he “*will end my participation in this exchange forthwith*” – unless I specifically respond to his vague 4 point challenge (with 3 qualifying points) – makes an early conclusion inevitable.

As this is my last article in the exchange I want to deal with the nature of Paul’s activist organisation – the Fluoride Action Network. This is scientifically relevant because it raises questions about how science should be done and communicated. I will precede that with another look at some of the scientific issues Paul disputes and briefly respond to a number of points he persistently raises.

But first I will respond to Paul’s use of certain “debate tactics” and his criticisms of the comment discussion that has accompanied these articles.

A scientific exchange or a “debate?”

Many readers are familiar with the debating tactics used by the Christian apologist William Lane Craig. He is always promoting himself by challenging others to “debate” him on his own choice of topic. Undoubtedly he is skilled in formal debate procedure and understandably he wants to choose his own “weapons.” But, formal combative debates are more a sport than a way of resolving issues (that is why we never use formal debates in science), more about egos than reality. The objectionable part of Craig’s approach is his use of the debate format as his way of attempting to control discussion. He tries to determine what subjects are covered and demand discussion centre around his own arguments. Intrinsic to his approach is to continuously pass judgment on his discussion partners – declaring they have not dealt with his argument, have failed to counter them, etc. Acting as the *de facto* debate judge he attempts to center discussion around his own arguments and will inevitably declare his opponents have lost the debate. This judgement is of course faithfully reported by his followers – to hell with the content of the discussion.

Do readers recognise the similarity to Paul’s approach, or should I spell it out? No, I think it is clear.

Right from the beginning I insisted this exchange not be a debate in the gladiatorial sense (even though we have tended to use the term loosely in titles, etc.). I rejected Paul’s request the discussion be restricted to his own book insisting we each have our own data and arguments and we should be free to choose and advance our own points. I know Paul did not want this but what could he do?

I think that is the normal mature way to approach scientific exchanges. It should not be about ego but aimed at drawing out the existing evidence and enabling discussion partners to

perhaps see things in a light they have not considered. It is not about winners and losers but about attempting to get a clearer picture of reality.

Moderating comments

Paul criticised my moderation of the discussion accompanying this exchange. He is upset that I did not prevent what he sees as personal attacks on him in comments being “*part of the visible record on is matter.*”

I recognised in undertaking to moderate discussion (a new thing for my blog but something I had been considering) that criticism was inevitable and my moderation would be used as an “excuse” when commenters were not effective. It has certainly been used as an excuse by a number of local anti-fluoridation activists for not participating in the discussion (but this has not stopped a lot of bad mouthing in the background on other forums like Facebook).

My approach to moderation was to hold back comments that were:

Clearly spam (such as posting videos without accompanying comment),

Extensive copy and paste without personal input (I personally feel insulted when commenters will copy and paste several pages from a book or web site, without any formatting to remove page numbers or add links),

Simply abusive without contributing to the discussion or providing information (No, I did not stop comments which were abusive or angry when they did have something of value in their arguments or information).

By repeating Steve Slott’s comment in the body of his article Paul has ensured his readers and supporters will now have Steve’s succinct criticisms and characterisations of Paul in front of them. Paul has extracted a single comment from almost 2000 and ensured it will be part of the public record by placing it in the body of his article. Presumably Steve will be chuffed that his comment was not lost to such readers by being buried in the comments section. Perhaps Paul would have been wiser to leave things as they were.

But perhaps Paul is using this comment as a diversion – or an excuse to accuse me of some sort of unethical behaviour. Or maybe this just results from his regular email contact with New Zealand anti-fluoride activists who are currently doing the same and discussing their “distaste” for me with them.

Correcting some misrepresentations

Sorry about the brevity and large number of these responses – a bit of responsive “Gish galloping” on my part!

Paul claims I argue “*that water fluoridation is the only way to go as far as fighting tooth decay is concerned*” yet I have never argued that at all. Several times I have pointed out

that other countries use different social policies like fluoridated salt, fluoridated milk, school mouth rinse programmes etc. I would be perfectly happy to see New Zealand switch to fluoridated salt, for example, if fluoridated water proved unacceptable to the majority of the population. In some ways fluoridated salt may work better than water because it would not be under the control of local councils vulnerable to being “picked off” by activist groups. And sometimes I question the technical possibility of reaching the more than 70% coverage through community water fluoridation required to reach the whole population. Salt fluoridation was discussed quite a lot in the comments discussion.

He claims I have a “distaste for opponents of fluoridation in NZ.” He is wrong (I have friends and family members I love who disagree with me on this question). But yes I do have a distaste for the **tactics** used by **some** of the activists. I also object strongly to the arrogant misrepresentation of the science commonly advanced by these activists. I find the fact Paul is in email contact with local activists and discussing their “distaste” for me unpleasant. I can imagine how nasty that discussion gets, but does he think that sort of bad mouthing advances anyone’s case? And has he responded to their bitching by urging them to participate in discussions here (as I have), or did he warn them to keep away?

He accuses me of not acknowledging there could be a problem for some individuals with increased sensitivity to fluoride and that I attack studies and “numerous anecdotal reports that have waved “red flags” on this issue.” Did he miss my comments in my last article that “I am happy to concede there may be a small number of people like this – as for other common chemicals in the environment?” Perhaps he chooses to ignore my conclusion “Maybe the most empathetic solution is that society as a whole compensate this small number of people in some way to aid them with their predicament.”

Paul has several times argued for a “weight of evidence approach” to the literature on fluoride. I will discuss this in greater depth in the section on the Fluoride Action Network. In principle this is exactly the same as my insistence that we should be approaching the literature in an intelligent and critical way. We should be considering all the literature, assessing quality, understanding flaws and strengths, considering the possible role of confounding factors and drawing interim conclusions from this overview. I think examples in this exchange show Paul often does not do that. Instead he often relies on cherry picked papers of poor quality. He even argues the lack of higher quality papers is a point in favour of the poor quality ones, when it may simply indicate other researchers don’t see the effect he wants. And he often claims studies support his conclusions when they don’t.

Paul criticises public funding of an information service in New Zealand set up specifically to facilitate a “weighted evidence approach” towards fluoridation research. Perhaps this shows his hypocrisy in the use of the term. However, Paul is thoroughly confused on this so a little information is required (readers can also refer to my article *Anti-fluoridationist astro-turfing and media manipulation*).

The **NZ Fluoridation Information Service** (NZFIS) is not publicly funded as Paul claims. It is an astroturf organisation set up by FANNZ, part of Paul’s International Fluoride Action

Network (see *Anti-fluoridationist astro-turfing and media manipulation*). The astroturfing is so clumsy they use the same contact address as FANNZ! Mary Byrne and Mark Atkin, activists for FANNZ, often act as spokespersons for NZFIS, using the organisation to give an air of credibility to their press releases. This astroturf organisation was also used to provide false credibility to Mark Atkin in an exchange of opinion [article](#) written for the *Journal of Primary Healthcare*. It is sometimes used to disseminate propaganda for Paul's FAN organisation using local press releases.

This aura of “credibility” rests on the confusion of the similarity of its name to the NZ **National Fluoridation Information Service** (NFIS). This is publicly funded and part of its role is to monitor the research literature and make summaries available. It is an information and advisory service supporting District Health Boards and Territorial Local Authorities by providing robust and independent scientific and technical information, advice and critical commentary around water fluoridation. It is the organisation that takes a “weighted evidence approach.”

Unfortunately the ploy of using similar names does confuse the news media at times. (The NFIS periodically has to set the media straight.) Apparently it even confuses Paul – and I have seen similar confusion from local anti-fluoridation activists.

Paul is still confused about the graphic I introduced early in this exchange showing data for fluoridated and unfluoridated areas of the Irish Republic. He insists it is a comparison of data for the Irish Republic and Northern Ireland. It is not. How many times must I repeat this?

He again avoids the importance of including social good in ethical considerations of social health policies like fluoridation. This time he does so by pretending that social benefits just don't exist. And yet he seriously proposes alternatives such as the Scottish ChildSmile programme and the programmes used in other European countries. Fluoride treatments are an integral part of the Childsmile programmes and fluoridated salt and milk is part of the programmes used in many European countries. What this boils down to is his insistence on individual choice as his over-riding concern and his absolute rejection of any concept of balancing this against social benefits. His insistence that fluoride has no beneficial effects and concern for harmful effects is merely an excuse for his concentration on individual choice.

Paul's emotional (or political) obsession with individual choice often comes through in the most unlikely places. Why should he use the term “forced fluoridation” in a polite scientific exchange? It is equivalent to a politician referring to public education as “forced secular education,” or our public health system as “forced free hospital care.” No one has secular education, free hospital care or fluoridation forced on them. There is always a choice for those prepared to make the effort to satisfy their convictions.

Paul claims I know “full well” he has disowned claims that “Hitler used fluoride to control prisoners.” No, I didn't (still haven't reached pages 256-258 of his book), but I am very pleased he has repeated his statements here. Let's disseminate these points far and wide:

Paul Connett rejects the arguments of some of his fellow fluoridation opponents that fluoride has been used “as a method of mind control.” He also rejects speculations that fluoridation is a “sinister plot to ‘dumb down’ the population” or “part of some world wide plan to reduce the size of the global population.”

I hope his fellow anti-fluoridation activists in New Zealand read this and take it on board. I hope they publicise Paul’s comments. I hope spokespersons for the local organisations reprimand any of the supporters who make these claims (far more of them do than Paul seems to think).

And I hope that Paul himself will repeat these assurances during his upcoming speaking tour of New Zealand – and particularly take to task supporters (like local spokesperson Dr Anna Goodwin) who repeat such rubbish. From my perspective he needs to push that message home loudly and often.

So thanks for that Paul – but why did he ignore my similar request?:

“I have yet to see him condemn the atrocious propaganda, lies and personal attacks of propagandists like Alex Jones and Vinny Eastwood. It is not enough to say he doesn’t necessarily support all their positions. The fact that he uses their services, and they use his, makes such weak dissociation disingenuous.”

Is his refusal to condemn such “atrocious propaganda, lies and personal attacks of propagandists like Alex Jones and Vinny Eastwood” an indication of his support for them?

He claims I wish to “avoid” education on oral health issues. That is just silly and he has no justification for the claim. Proponents of fluoridated water supplies, fluoridated milk, fluoridated salt, fluoride dental treatments, etc., just do not see the world is such a naive black and white way. Fluoridation in any form is not a substitute for good oral hygiene. Health authorities will often operate campaigns of all sorts aimed at fighting tooth decay and education about oral hygiene is very common. We do in New Zealand and Paul has several times referred to such programmes in Scotland.

Paul’s attempts to deny the scientific consensus about the contribution of fluoride in drinking water to increasing concentrations in saliva and tooth surface biofilms has become desperate and farcical. I can only conclude this is because he has been promoting the mantra of “topical application” as a way of hiding the “surface mechanism” message.

He insists I have ignored his claims on margin of safety asking where my comments on this are. Yet, several times he has ignored my request for him to justify the low safety of margin he derives from the paper of [Xiang et al \(2003\)](#). I find it hard to believe he has not seen my requests (although that would be possible if he has not been reading my articles

seriously). However, this could just be a cynical ploy as part of his campaign to pretend I am avoiding issues. I mentioned this above in my comment on debating tactics.

Briefly on the pineal gland and calcification (although not as briefly as Paul’s Gish galloping reference to it). It is a favoured subject of many anti-fluoride propagandists and they often give it mystical overtones with reference to a third eye, etc. Calcification is not caused by fluoride – it is caused by calcium, phosphate and old age. Because the bioapatites in calcified tissues are actively undergoing mineralisation and remineralisation they easily incorporate fluoride into their structure and this leads to higher concentration of fluoride in calcified tissues than in bones generally.

A similar situation occurs with calcium rich plaque deposits in cardiac arteries. [Li et al \(2011\)](#) suggested that fluoride incorporated into such deposits could be used to identify their occurrence by measurement of F-18 using positron emission tomography. They were describing a diagnostic method and yet Declan Waugh and other activists disingenuously use this paper as some sort of “proof” that fluoride increases the risk of heart attacks!

I am surprised Paul has taken the approach of blaming practically every illness or change on fluoride. Arthritis, early onset of menstruation, all the symptoms attributed to “fluoride sensitivity,” osteosarcoma and other cancers, hypothyroidism, and so on. It is a common tactics of the non-scientific, even anti-scientific, rank and file anti-fluoridation activists to blame all the ills of the world on fluoridation – but one expects more from a trained scientist.



Some of the ills fluoride gets blamed for.

Despite the many advantages of modern society we do appear to face an increase in some health problems. Obesity has become far more common, for example. Surely the scientific approach is to attempt to identify the real causes properly. To start by blaming fluoride (or any other chemical) without evidence, is misleading. It is even worse to insist on attributing this as a cause to the exclusion of all else and to demand research only into such a dogmatic hypothesis – as Paul does. This ideologically driven labelling is not only dishonest. It is dangerous as it diverts efforts away from proper objective research and serious investigation of the problems. It inhibits proper identification of causes.

Paul insists on using the authority fallacy – out of context quotations from authoritative figures. An example in his last article was that by David Locker. Perhaps he is not aware he is doing this – it seems to be an instinctive reaction for anti-fluoridation activists. He should appreciate that the world is never as simple as implied by such quotes. I see his resort to such fallacies as a weakness, not a strength.

The Hastings experiment

Paul's description of the Hastings experiment is biased and reeks of conspiracy theory. He has since included the same information in an internationally distributed newsletter entitled "*New Zealand Fluoridation Fraud.*" This is being disseminated in New Zealand and, I suspect, Paul will push this story during his upcoming speaking tour here. I always consider allegations of scientific fraud to be very serious. Usually a researcher's whole career is at stake as it is one the most serious allegations that can be made.

Typically, Paul's bias means he relies on a single source for his story. He writes that he "*would be anxious to see if Ken can throw a different light on this matter.*" While this is not the place to give a full and more balanced history of the Hastings experiment (and I haven't done the research for this) I will make just a few comments to expose Paul's bias.

Paul quotes John Colquhoun:

"The school dentists in the area of the experiment were instructed to change their method of diagnosing tooth decay, so that they recorded much less decay after fluoridation began."

This just shows how simple facts can be distorted to fit a conspiracy theory. My own family remembers this change in dental technique by the school dental service because it was **country wide – not restricted to Hastings** as Colquhoun, and Paul, imply. There goes the conspiracy theory and Paul's claim of a scientific fraud.

Akers (2008) agrees these changes confounded the experiment:

"The changing of NZSDS [NZ School Dental Service] diagnostic criteria for caries and the cessation of the NZSDS nurses' practice of prophylactic restoration of fissures further confused interpretations. While later anti-fluoridationists justifiably claimed that the changed diagnostic criteria contributed to the fall in caries (Colquhoun, 1999), their "science or swindle" questioning of methodology and findings (Colquhoun and Mann, 1986; Colquhoun,

1998; Colquhoun and Wilson, 1999) simplified confounding variables and dismissed international evidence supporting community water fluoridation as one factor in declining community caries incidence (de Liefde, 1998)."

So science, probably bad science, but not the "swindle" Paul wants to believe – and wants us to accept. As an aside, I think changes in dental practice like this will have also contributed to the graphs Paul and other anti-fluoride activists love to use to prove improvement of oral health in the absence of fluoridation – yet they never discuss that sort of detail. It is a potential problem with any longitudinal study and Colquhoun was criticised for ignoring it in his own presentation of New Zealand data.

Akers also refers to the problem with using Napier as a control city:

"The abandonment of the control city (Napier) because it had a lower initial caries rate than that of Hastings (Ludwig, 1958) implicated soil science as a confounding factor in New Zealand cariology (Ludwig and Healey, 1962; Ludwig, 1963)."

I referred to my memories of this discussion about the role of other trace elements in dental health in a previous article (see [*Why I support fluoridation*](#)).

Yet, how does Paul express this: *"after about two years the control city of Napier was dropped for bogus reasons."* So Paul considers the fact it was not suitable as a control to be bogus?

The Hastings experiment (or "project" or "demonstration") was also confounded by political changes, birth of the anti-fluoridation activity in New Zealand, loss of support from the Hastings City Council, and so on.

That is the problem with conspiracy theories – they paint the world black and white which is very unrealistic. I expected far more professionalism from Paul than this.

The Scottish ChildSmile programme

Paul returns to this through quoting material from Bruce Spittle. What I find a little weird is that his original reference to this programme was as an argument for an alternative to fluoridation. But he seems oblivious that Bruce's note reveals that use of fluoride varnishes is an integral part of the programme.

In fact the programme includes this target:

"At least 60% of 3 and 4 year old children in each SIMD quintile to receive at least two applications of fluoride varnish per year by March 2014."

It is an excellent programme but only Paul seems to see it as an alternative to use of fluoride. Here is a quote from the [ChildSmile programme](#):

"The Scottish Dental Clinical Effectiveness Programme (SDCEP) Prevention and Management of Dental Caries in Children guidance outlined that the benefits of fluoride varnishing should

be extended to all children. They recommend fluoride varnishing twice a year to all children over two years of age.

Even at very low levels, fluoride in the plaque and saliva is able to alter the balance between demineralisation and remineralisation, favouring the remineralisation process. As the remineralisation happens in the presence of fluoride, the new mineral crystals are stronger and less susceptible to acid attack.

When fluoride is present in the saliva, the fluoride ions become concentrated in the plaque. When sugars then enter the plaque, the presence of fluoride reduces the conversion of dietary sugars into acid by plaque bacteria with less acid produced.

HOW FLUORIDE VARNISH WORKS:

it slows down the development of decay by stopping demineralisation

it makes the enamel more resistant to acid attack (from plaque bacteria), and speeds up remineralisation (remineralising the tooth with fluoride ions, making the tooth surface stronger and less soluble)

it can stop bacterial metabolism (at high concentrations) to produce less acid.

Fluoride varnish leads to heavy remineralisation of the enamel surface, and subsequent acid attacks will allow fluoride ions to penetrate more deeply into the tooth structure. Varnishes like Duraphat® are useful because they stay on the tooth surface for some hours, allowing slow release of the fluoride ion.”

Improving oral health and effects of stopping fluoridation

Despite our discussion of the errors in drawing the conclusions he does from declining tooth decay in European countries he continues to naively present that as “proof” fluoride plays no role in oral health. And he is still completely confused about the Irish data I presented – this was for one country, Ireland. **I was not comparing Northern Ireland and Ireland in any way.** His claims that oral health shows no decline when fluoridation is stopped involves a similar misrepresentation of the evidence.

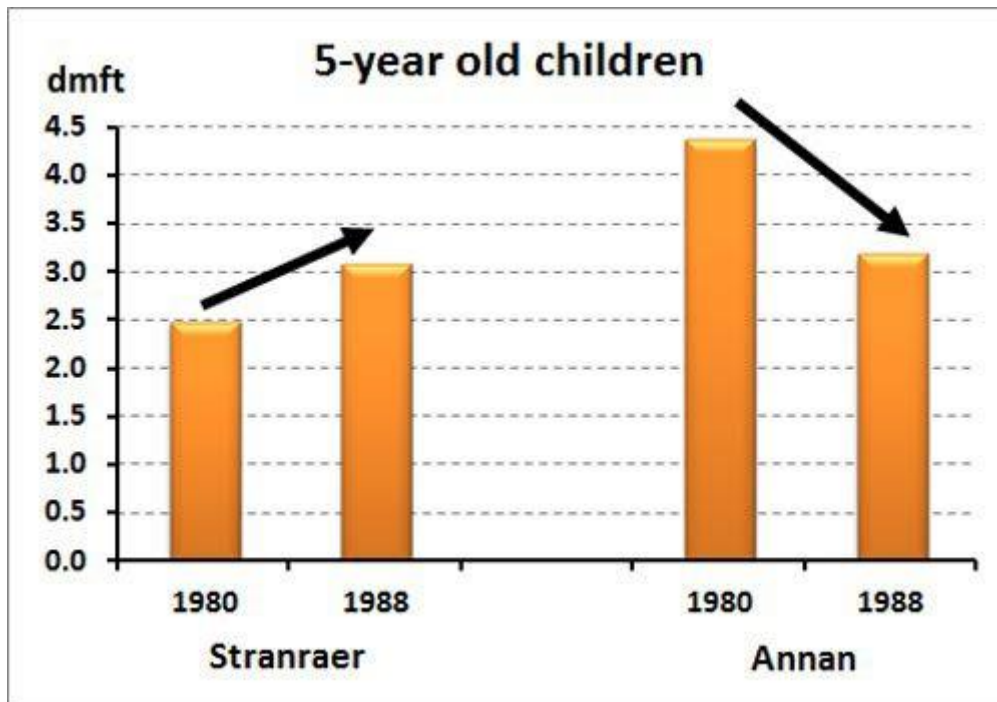
I am glad he acknowledges the protective role of other fluoride treatments after fluoridation was stopped in La Salud, Cuba, and the former DDR. But seriously, did he not know that already? Had he not checked out the studies which activists rely in to make these claims? And will he now stop using those examples in future presentations and discussions? I suspect not.

This shows all the earmarks of cherry picking studies to confirm his bias and basing arguments on studies he has not bothered checking. He attempts to deflect criticism by saying “*It is not clear if Ken believes that alternative methods were applied to explain the results in Finland and British Columbia.*” Well, perhaps I should spell it out – I don’t have a “belief” about those studies because I have not checked them out. But I suspect they do not support Paul’s arguments against fluoridation any more than the Cuban and German studies do.

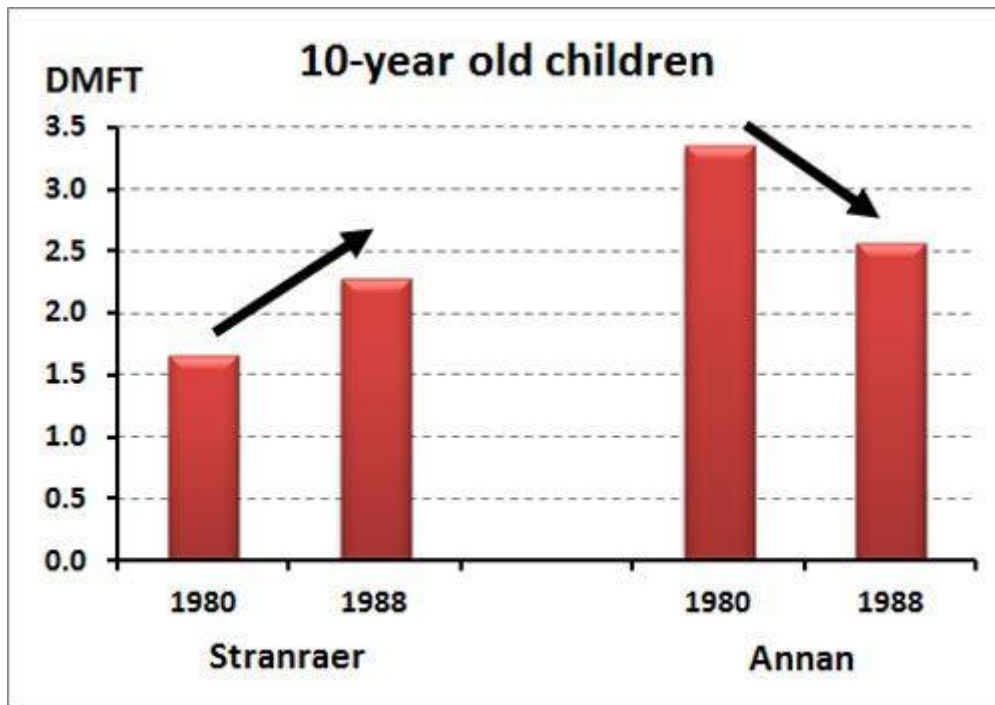
(After all I am sure Paul would be describing the details by know if they did). He has already lost that argument and he is desperately clutching at his remaining straws while the rest of us have moved in to the next issue wishing to spend our valuable time on more important things.

Once again I can illustrate some of the problems with his cherry picking and simplistic interpretations by comparing the changes in oral health of two Scottish communities described in a study by [Attwood and Blinkhorn \(1991\)](#), “*Dental health in schoolchildren 5 years after water fluoridation ceased in South-west Scotland.*”

This compared caries prevalence in two towns in both 1980 and 1988. One town, Annan, had never had fluoridated water while the other, Stranraer, had it until 1983. The graphics show the results for 5 year old and 10 year old children.



Decayed missing and filled deciduous teeth for 5 year olds. Stranraer fluoridated until 1983. Annan not fluoridated.



Decayed missing and filled teeth for 10 year olds. Stranraer fluoridated until 1983. Annan not fluoridated.

Paul might want to seize on the Annan results to argue that fluoridation has no effect on oral health as they show the same pattern as the European data he loves to present. But in this case we see that stopping fluoridation did have a significant negative effect on caries prevalence for Stranraer – even though oral health of these children in the two towns was similar in 1988.

I fully accept this is just one study, and by itself is not conclusive (I don't claim it is). Nor have confounding factors been considered. Paul can claim I have “cherry picked” it. All perfectly valid criticisms – but that only describes the process used by Paul and his fellow activists. They have chosen papers they think supports their case. That is not good science. We should be basing our conclusions on a proper critical and intelligent review of all the studies – not selecting ones which suit us.

Even with the study of Attwood and Blinkton described above activists from either side of the fluoridation debate can select or cherry pick “evidence” to fit their predetermined case. To argue either that it “proves” fluoride is not effective for oral health as shown in Annan where tooth decay declined despite there being no fluoridation. Or to argue that it “proves” fluoride is effective because oral health declined after fluoridation in Stranraer was stopped.

Nature of Fluoride Action Network

It is important this exchange not finish without considering the nature and role of Paul's activist organisation, the Fluoride Action Network (FAN). I commented in previous articles about the problems of scientists becoming involved in activism. FAN illustrates those problems of cherry picking, confirmation bias and group thinking. Here I will comment on

some of the specific ways these are manifested in FAN and it's international role in the anti-fluoridation movement.

Martin (1991) and Newbrun (1996, 1999) described the social base of anti-fluoride activism as a weird mixture of fundamental greenies, misguided environmentalists, food faddists, anti-science “naturalists,” chiropractors and right-wing extremists. I guess readers could add more to this list but anyone who has watched the videos of the submissions made by anti-fluoridation activists to the Hamilton City Council hearings this year will recognise all these elements. They are all ideologically driven, illustrate characteristics of cherry picking, confirmation bias and group thinking, and make extensive use of the services FAN provides.

These social groups, and their associated businesses, also provide an organisational and financial backing to FAN and its regional organisations like the Fluoride Action Network of NZ (FANNZ). One current is the NZ Health Trust which attempted to get a judicial review of South Taranaki's decisions on fluoridation in the High Court.

FAN works hard to select scientific literature which can be interpreted, or reinterpreted, to support the anti-fluoridation case. They have accumulated a large database of such literature – a useful resource for the naive internet commenter wishing to “prove” fluoridation is evil. This database, and its extensive internet use by activists, has produced high Google search rankings for articles promoting an anti-fluoride case – frustrating for the honest Google user attempting to find more objective material.

The organisation certainly searches far and wide for any scientific report or paper which can be used to further their cause. Apparently the normally accessible scientific literature has not been fruitful enough for this purpose so they are making more use of obscure foreign sources. They have put a lot of effort into translation of Chinese publications and recently put out a request for people to translate foreign material in other languages.

Clearly FAN is searching for anything that can be used as “evidence” for negative effects of fluoride in human and animal health. This is not a critical or intelligent approach to the literature. I am all for the possibility of finding interesting ideas in foreign untranslated and obscure papers – I have done so myself. But the FAN motives are all wrong. They are uncritical, unintelligent and selective in their search. The quality of the research they use is their last concern – which is hypocritical considering the frequent demands for proponents of fluoridation to produce replicated double blind studies.

The FAN database gets a lot of unintelligent use by fluoride activists throughout the world. Naive quoting and citing is very common in social media like Twitter and Facebook. Commenters in blogs will often simply post a quote or even just a link – drive by trolls. People who commonly read and use the scientific literature properly shudder to see such unintelligent use as it downgrades the idea of scientific knowledge.

FAN also makes videos available for similar use.

In effect FAN heads an international network. There are “action networks” and “fluoride free” organisations in many countries and regions where fluoridation is an issue. In New

Zealand there is FANNZ, as well as regional Fluoride Free structures and Facebook pages. Mary Byrne, National coordinator of FANNZ is also an Advisory Board member on Paul Connett's FAN organisation.

These international links are apparent in the way that media is manipulated by planting propaganda material. FAN will issue press releases which get faithfully transmitted by the alternative media connected with conspiracy theorists, natural and alternative medicine and practitioners, food faddists, some environmental groups, etc. These press releases also get planted locally by groups like FANNZ, sometimes using its astroturf group, the NZFIS. They also get picked up and reproduced by bloggers. Links and simple, very often misleading, one liners get transmitted ad nauseum by Twitter and Facebook.

Sometimes the normal mass media will reprint a press release, or pick up an article from elsewhere giving it a prominence it doesn't deserve. And of course, these are immediately promoted on Facebook and Twitter as if they were independently sourced stories.

Example of Israel and its decision to regulate on the mandatory stays of fluoridation.

Whether intentionally, or just because of human foibles, part of international promotion is the use of personality cult. We can see this in New Zealand with Paul's upcoming speaking tour. Locally he is being promoted and advertised as the "World Fluoridation Expert" – despite the fact that he has no research papers to his name on the issue. In a previous article I referred to his claimed 18 years research into fluoride and his self-promotion as an expert:

“with such a reputation it is reasonable to expect a body of publications in reputable peer-reviewed scientific journals. My simple searching does not show any, although he does list 2 which I could not find on-line in a recent CV. Could Paul give us a relevant publication list? And links to the papers.”

Significantly, this is another of my questions Paul has chosen to ignore.



**Prof Paul Connett - World Fluoridation Expert
- Wellington Feb 2014**

Local Facebook advertisement for Paul's NZ tour.

Paul also has remained silent on my critique of the *Fluoride* journal and his relationship to it. His organisation FAN is currently campaigning to win respectability for that journal in the wider scientific community. I can understand FAN's motives for this – but the tactics? Promotion of a journal by an activist organisation which often attacks science and scientists would normally be considered the kiss of death.

Concluding comments.

This is the last article in my exchange with Paul Connett. Although, if he insists, I will not deny him the right of reply.

I have enjoyed the exchange. It has been useful for me to get my ideas into some sort of order and to get a measure of the arguments used by opponents of fluoridation. In that respect I am conscious that Paul does not adhere to some of the common arguments used. I am glad he dissociates himself from some of the extreme right wing propaganda in the anti-fluoridation movement claiming an Agenda 21 conspiracy to control population and keep us dumb. Nor does he promote the silly arguments claiming fluoridation was used for this purpose by Nazis in the concentration camps. The negative side is that we did not get to see those arguments presented properly and I did not get to look at them more critically.

There have been a large number of comments on these articles and I believe they are of higher quality than we commonly see in discussions of fluoride. Many commenters have presented useful arguments and information with many useful citations. I have found these valuable and urge readers to go back and browse comments for them.

The links to all the articles in the exchange are listed by date on the [Fluoride Debate](#) page. In the new Year I will put the articles together in a PDF document (and maybe an eBook format) so readers can download and consult at their leisure. Maybe we could even use Paul Connett's speaking tour of New Zealand early in the year to encourage people to read the exchange.

Finally thanks to Paul Connett for agreeing to this exchange (it was actually his idea to try it as an on-line exercise) and to all the people who participated in the comments discussion.

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Closing statement: Paul Connett - January 22, 2014

A final attempt to bring this debate back to science.

The structure of this posting.

Part A. A few introductory comments

Part B. Ken's claim that the Hastings trial was not "fraud" but bad science

Part C. Major issues that have been avoided or poorly addressed

1. The difference between concentration and dose
2. The need for a Weight of Evidence analysis – especially on fluoride's impact on the brain
3. The need for a Margin of Safety Analysis when harm has been found at a certain level
4. A margin of safety analysis for lowered IQ
5. Bottle-fed babies: a special case
6. Osteosarcoma: politics versus science

PART D. A response to some of the issues raised in Ken's last posting –[*Ken Perrott's closing response to Paul Connett? December 30, 2013*](#) not covered in Parts A-C.

PART E. A Summary of the key arguments against fluoridation

PART A. Introductory comments

A.1) Attacking the messenger instead of dealing with the message

A lot of time was wasted in Ken's final posting [*Ken Perrott's closing response to Paul Connett? December 30, 2013*](#) in attacking the Fluoride Action Network, FAN-NZ and other opponents of fluoridation. In my view, Ken would have served his pro-fluoridation position better by providing solid scientific references to support the proponents' claims of effectiveness and safety. I address some of the specific issues he raises in part D below.

A.2) There are some important unresolved issues, which I have raised in earlier posts but not fully addressed by Ken. I will cover these in Part C.

PART B.

B.1 The Hastings-Napier Fluoridation Trial Fraud

Let me summarize the bare bones of the issue here.

The Hastings Napier trial was meant to have Hastings as the fluoridated community and Napier as the control. In other words it was going to be cross-sectional study – comparing tooth decay in two cities at the same point in time after one had been fluoridated and the other had not. Shortly into the experiment the control city was dropped, thus the study became a longitudinal one. In this case comparing the tooth decay in one city (Hastings) at the beginning and end of the trial.

For such a comparison to be valid, there must be no change in *key parameters* during the trial. However, there was a change in one of the key parameters in this trial *and it was a major parameter* – the method of diagnosing and treating tooth decay. This was less stringent at the end than it was at the beginning. Thus the drop in tooth decay attributed to fluoridation was part, or all, the result of making the diagnosis and treatment of tooth decay less stringent.

What convinces me the final report was a fraud was that the authors did not mention the change in diagnosis when claiming the drop in tooth decay was due to fluoridation. In my view this was more than an oversight or just “bad science” as Ken argues. As this trial was used to promote fluoridation throughout NZ it is a very serious matter indeed.

Ken makes three points that do not pertain to the central fraud discussed above and completely ignores the “smoking gun” letter from NZ Dental Director G.H. Leslie.

First, Ken says that the method of changing the diagnosis of tooth decay was applied throughout NZ and not just locally. Ken argues:

“My own family remembers this change in dental technique by the school dental service because it was country-wide – not restricted to Hastings as Colquhoun, and Paul, imply. There goes the conspiracy theory and Paul’s claim of a scientific fraud.”

No it doesn’t. Whether the diagnosis and treatment of tooth decay was changed locally or nationally, the authors of the report should have acknowledged this very important change in their report. Their failure to do so – and claiming that their study showed that fluoridation was a great success – was a fraud. What legitimate researchers should have done was to instruct the nurses not to change the way teeth were treated in Hastings (regardless of what was happening in the rest of NZ). In this way they could have maintained the same situation with this key parameter at the beginning and the end of the trial. But they didn’t.

Ken’s second point was to argue about why the control city was dropped. However, whether the control city was dropped for bogus or legitimate reasons the central charge remains the same. The resulting longitudinal study in Hastings was a fraud because of the fundamental change that was made and not announced by the authors.

Ken’s third point is his citation of paper by Akers (2008) to convince us that it wasn’t a swindle but bad science. But Akers’ comment is certainly not a rebuttal, if anything it is a confirmation.

Here is the quote from Akers:

“The changing of NZSDS [NZ School Dental Service] diagnostic criteria for caries and the cessation of the NZSDS nurses’ practice of prophylactic restoration of fissures further confused interpretations. While later antifluoridationists justifiably claimed that the changed diagnostic criteria contributed to the fall in caries (Colquhoun, 1999), their “science or swindle” questioning of methodology and findings (Colquhoun and Mann, 1986; Colquhoun, 1998; Colquhoun and Wilson, 1999) simplified confounding variables and dismissed international evidence supporting community water fluoridation as one factor in declining community caries incidence (de Liefde, 1998).”

Readers will note that Akers does not claim that the diagnostic wasn’t changed. He admits that it was and he acknowledges that, “antifluoridationists justifiably claimed that the changed diagnostic criteria contributed to the fall in caries”

Whether there were other confounding factors not acknowledged by Colquhoun, the charge of fraud centers around the important change in diagnostic that *wasnot acknowledged by the authors of the report.*

Ken also ignored the incriminating evidence presented in the letter from G.H. Leslie, the Director of Dental Health for NZ that I quoted in my previous post.

There is no doubt about the validity of this letter. This “smoking gun” letter was obtained by Colquhoun who used the Official Information Act 1982 to obtain all the files pertaining to the Hastings-Napier trial from Department of Health files (1951-1973) now held in National Archives, Wellington. This letter from Leslie was found in those files and was reprinted in the paper by Colquhoun and Wilson (1990).

Here is the letter again:

12, October 1962

Mr. Swann,

I have delayed acknowledging receipt of Dr. Roche’s letter to you and replying to your minute in the hope that I would by now be able to give a positive reply to your enquiry. I still cannot.

No one is more conscious than I am of the need for proof of the value of fluoridation in terms of reduced treatment. It is something which has been concerning me for a long time. It is only a matter of time before I will be asked questions and I must have an answer with meaning to a layman or I am going to be embarrassed and so is everyone else connected with fluoridation. But it is not easy to get. On the contrary it is proving extremely difficult. Mr. Espia is conferring with Mr. Bock and Mr. Ludwig and I am hopeful that in due course they will be able to make a practical suggestion.

I will certainly not rest easily until a simple method has been devised to prove the equation fluoridation = less fillings

(G.H. Leslie)

Director

Division of Dental Health

According to Colquhoun and Wilson (1990) what was concerning Leslie in 1962 (which was 8 years into the 10-year Hastings trial) was that the Hastings tooth decay statistics showed little difference between those exposed to fluoridation in Hastings and the rest of unfluoridated New Zealand. In other words, fluoridation wasn't working.

Miraculously, two years after this letter was written, the Fluoridation Trial report showed that the Hastings trial was a great success!

In conclusion, I can find no evidence of a published rebuttal of the conclusion that this Hastings trial amounted to fraud. Certainly Colquhoun's co-author Professor Robert Mann is not aware of one and I have checked with him.

PART C: Elaboration of some key issues so far not satisfactorily resolved

C.1) The difference between concentration and dose

In our exchanges Ken has never commented on the key difference between concentration (mg/liter) and dose (mg/day). This question is important because leading proponents, organizations and agencies that promote or defend fluoridation often blur this key distinction in a self-serving manner.

For example, the American Dental Association (ADA) denied the relevance of the National Research Council's groundbreaking review on the toxicology of fluoride in drinking water (NRC, 2006), to water fluoridation – on the day it was published – because they argued that the NRC panel only found harm in the range of 2 – 4 ppm and in the U.S. we fluoridate in the range of 0.7 – 1.2 ppm. The Oral Health Division of the Centers for Disease Control and Prevention (CDC) made similar claims six days later as did the Australian Government's NHMRC Report in 2007.

One of several things wrong with this argument by the ADA, CDC and NHMRC is that above-average water drinkers in communities with 0.7 – 1.2 ppm could easily get higher doses than some of the below-average water drinkers in the communities at 2 ppm and even 4 ppm. In short, the concentrations may be different but the doses overlap – and it is the dose that can cause harm.

Fluoridation proponents continue to make the same claims today when they argue that we can ignore the studies that have found a lowering of IQ associated with fluoride exposure (Choi et al, 2012) because they were carried out at higher concentrations than the levels we use in water fluoridation programs. The weaknesses of such arguments will become clear in my margin of safety analysis based on 5 of the studies in the Choi review below.

C.2) The need for a “weight of evidence” analysis – especially on fluoride's impact on the brain.

In toxicology we seldom have a definitive study about the risks or safety of a particular substance sufficient to resolve a dispute to everyone's satisfaction, especially to the satisfaction of those with special interests. That is why some bodies favor the application of the Precautionary Principle, (Tickner and Coffin, 2006) into which we go into in some detail in chapter 21 of *The Case Against Fluoride*...

Less controversially many regulatory agencies settle for a "weight of evidence" analysis where they carefully balance all the studies – including both human and animal, as well as epidemiological, clinical, and biochemical – before they conclude one way or the other whether a particular chemical is going to cause harm to any specific population.

I have provided a list of studies on the brain from which the "weight of evidence" suggests that fluoride is a neurotoxin and could well be lowering the IQ of children. Ken has yet to produce any studies that would outweigh this conclusion. Here is that list again:

In over 100 animal studies that we have examined, at least 40 show that prolonged exposure to fluoride can damage the brain

At least 19 animal studies report that mice or rats ingesting fluoride have an impaired capacity to learn and remember

At least 12 studies (7 human, 5 animal) link fluoride with neurobehavioral deficits

3 human studies link fluoride exposure with impaired fetal brain development, and we are not aware of any that don't

37 out of 43 published studies show that fluoride lowers IQ, of which 27 were part of a meta-analysis conducted by a team from Harvard (Choi et al. 2012)

The full citations to all these studies can be accessed at www.fluoridealert.org/issues/health/brain

With respect to the lowering of IQ several of the studies are strengthened by the fact that the lowering of IQ was inversely related to *urine* fluoride levels (Xiang et al., 2003 and Ding et al, 2011). In addition, Xiang et al (2011) showed that the lowering of IQ was inversely related to *plasma* fluoride levels. In other words the lowering of IQ can be related to individual exposure to fluoride.

The NRC (2006) report had a whole chapter on this matter and so do we, in *The Case Against Fluoride*..., but the proponents of fluoridation have done their level best to ignore, downplay or distract attention from this landmark NRC review as well as the updated discussion in our book, and most recently the systematic review by Choi et al (2012).

As far as the IQ studies are concerned, at the time the NRC (2006) reviewed the matter there were only *five* IQ papers available to them. Even so, the NRC panel – while pointing out some weaknesses in these studies – commented on the consistency of the results and recommended more research. But none has been published in the U.S. or any other fluoridated country in the 7 years plus since the NRC recommendation was made.

Thanks to translations made available by the Fluoride Action Network of studies previously published in China, and several new studies from Mexico, Iran and India, there are now 43 IQ studies available. 37 of these indicate a statistically significant lowering of IQ associated with fluoride exposure. The Harvard team reviewed 27 of these studies (Choi et al, 2012) and found a lowering of IQ in 26 studies, with an average lowering of about 7 IQ points.

Ken is rightfully concerned about the well-being of children from low-income families, but is he willing to put the questionable benefit from fluoridation above the possibility of harm to their neurological and mental development? Especially when other countries have achieved success with alternative approaches. Why force whole populations –especially low-income families who cannot afford avoidance measures – to take such risks?

C.3) The need for a “Margin of Safety” Analysis when harm has been found at a certain level

This analysis is critical when you are considering rejecting the relevance of a study based on the *dose levels* used, or *concentrations* in the case of fluoridation proponents.

It is important to remember that in any large population we can anticipate a very large range of sensitivity to any toxic substance. Like most other human traits such sensitivity follows a normal distribution curve (the famous bell-shaped curve). Most people cluster around the average – the bulge of the bell – and will have an average response but at the tails of this curve – the lips of the bell – we will have people who are very sensitive at one end and very resistant at the other. Typically toxicologists assume some people are going to be at least 10 times more sensitive than the average person. This is used to generate a default safety factor of 10 (sometimes referred to as the “intra-species variation” safety factor). This default value is only dropped to a smaller value than 10 if the population in the study group is very large.

Thus if we find harm in a small human study and wish to determine the level that would protect everyone in a large population from that harm this is what we do. We take the dose (mg/day), which has been found to cause no harm (the so-called no observable adverse effect level or NOAEL) and divide that dose by 10 to give a safe dose for the most sensitive individual in the population. Frequently we don’t have a NOAEL and so we have to use a LOAEL (the lowest observable adverse effect level) and divide that by 100. Sometimes this process is corrupted and it is the LOAEL not the NOAEL that is divided by 10. The method used by Xiang (2003 a) is a variant on this method, but it usually arrives at similar end points. It uses all the data in a study to find the dose-response curve, not just the NOAEL and LOAEL.

Applying these calculations in a real world situation is called a Margin of Safety Analysis and shockingly it is very seldom considered by people who promote fluoridation. They simply use the very crude and highly misleading approach of comparing the concentration used in the study group with the concentration of the fluoride in the water of the fluoridated population, as discussed above in C.1.

C.4 A margin of safety analysis for lowered IQ

Ken has reasonably questioned how Xiang determined the threshold value that I used in the Margin of Safety analysis in a previous posting. In rechecking Xiang's explanation I find it is rather complicated, even though he appears to have used a methodology advocated by the US EPA. I have no problem with Ken raising this question but I do have a problem with the way he has used this one detail as a way of avoiding the main exercise. That main exercise is how one goes about determining a safe dose for everyone in a large population when one has evidence that there is harm in a small study group.

I am going to repeat the margin of safety analysis for lowered IQ without using Xiang's threshold value of 1.9 ppm. Instead, I will start with the nine studies where IQ was lowered at a fluoride level less than 3 ppm.

Of these nine studies I have used five of the six where the result is statistically significant. The sixth is a study by Lin et al (1991), which I have excluded because it is complicated by the iodine levels involved. These five studies had levels where IQ was lowered in the high-fluoride village at 1.8; 2; 2.38; 2.5 and 2.9 ppm. See Table 1.

IQ studies with water F concentration below 3 mg/L in "higher F group", and with statistically significant results

Study	IQ point difference	Water F concentration "high F group" (mg/L)
Lin et al. 1991	-9.6	0.88
Xu et al. 1994	-14.0	1.8
Yao et al. 1997	-6.5	2
Hong et al. 2001	-6.6	2.90
Seraj et al. 2006	-13.4	2.5
Poureslami et al. 2011	-6.2	2.38
Averages	-9.4	2.08

TABLE 1

Here is a step-by-step explanation of my margin of safety analysis.

Step a) As our starting point I choose the study that found a lowering of IQ at the lowest concentration. That was 1.8 ppm.

Step b) Our next task is to estimate the reasonable dose range this represents for the children in the study group – which of course, will depend on how much water they drink and how much they get from other sources. We assume (correctly, we believe) that very few of these

rural Chinese children use fluoridated toothpaste and that their daily dose comes largely from the water.

If they drank 2 liters of water per day at 1.8 mg/liter (i.e. 1.8 ppm) their daily dose would be $(2 \text{ L} \times 1.8 \text{ mg/L}) = 3.6 \text{ mg/day}$.

If they drank 1 liter of water per day their daily dose would be 1.8 mg/day

If they drank 0.5 liters of water per day their daily dose would be approx 0.9 mg/day.

In other words a reasonable estimate of the range of the dose leading to a lowered IQ was approximately 0.9 – 3.6 mg/day.

Step c) Our third task is to determine a safe dose to protect all the infants and children from lowered IQ *in a large population*.

From this range the LOAEL is 0.9 mg/day. We do not have a NOAEL so we have to divide the LOAEL by 10. So the NOAEL = 0.09mg/day.

To protect every child (including the most vulnerable) we have to divide the NOAEL by a further factor of 10. This is being very conservative, but it is the standard procedure unless one has data from a large population study.

Thus we would not want any child in a large population ingesting more than 0.009 mg/day of fluoride to protect against lowered IQ (NOAEL divided by 10). This translates into 9 ml of water fluoridated at 1 ppm . Here is the calculation. $9 \text{ ml} = 0.009 \text{ Liters}$. $0.009 \text{ L} \times 1 \text{ mg/L} = 0.009 \text{ mg/day}$

Of course this is a rather crude measure because the subjects in this study were children, whose weight (and hence perhaps tolerance of fluoride) varies according to age and other factors. We shall refine this shortly in relation to infants.

Conclusion. Based upon the five statistically significant IQ studies that found a lowering of IQ at less than 3 ppm a responsible regulatory authority would not allow water fluoridation. Little wonder then that fluoridation promoters are doing everything they can to criticize these IQ studies.

Note: this is an analysis based on the data available. Of course there are things we don't know which can affect the interpretation. For example we don't *know* that post-natal fluoride consumption is the most important variable: it might be prenatal exposure.

C.5) Bottle-fed babies: a special case

Let me return to the issue that got me involved in this matter 17 years ago: the level of fluoride in mothers' milk. I do not believe Ken has provided a convincing explanation as to why we should ignore this issue.

The level of fluoride in mothers' milk is very low. For a woman in a non-fluoridated area it is about 0.004 ppm (NRC, 2006, p.40), although a range of values has been reported.

There are certain realities about the fluoride ion which make it incompatible for a lot of biochemistry – always given the important caveat of the concentration levels reached – and

these are its ability to seek out positive centers like metal ions and hydrogen bonds – both critical for biochemical structure and function.

These fundamental attractions can easily explain fluoride's known ability to inhibit enzymes, help to switch on G-proteins non-specifically, and possibly cause oxidative stress. These interactions are so fundamental that we should not be at all surprised if many ailments may be caused by fluoride. It was the American Medical Association (before fluoridation began) that used old-fashioned terminology when it stated that fluoride was a “general protoplasmic poison” in its warning not to rush into water fluoridation in a 1943 editorial in JAMA.

So let us briefly extend the margin of safety analysis to bottle-fed babies.

Here we have to take into account the extra problem of the baby's small bodyweight. To take bodyweight into account we use a different measure of exposure: i.e. *dosage* instead of *dose*.

Dose is measured in mg/day, dosage is measured in mg/kilogram bodyweight/day.

If we consider that the ‘safe’ dose we have determined (0.009 mg/day) and apply that to 20 kg child, then we would say the safe dosage was 0.00045 mg/kg/day (0.009 mg/day divided by 20 kg). Then the safe dose for a 7 kg baby would be 0.00315 mg/day. ($7 \text{ kg} \times 0.00045 \text{ mg/kg/day} = 0.00315 \text{ mg/day}$).

A breast fed baby (with mothers milk at 0.004 ppm) drinking 800 ml a day would get $0.004 \text{ mg/L} \times 0.8 \text{ L} = 0.0032 \text{ mg/day}$ **which is very close to the level we have determined is safe**. So based on these calculations, the fluoride that naturally occurs in breast milk does not pose a risk of lowering the IQ in babies.

A bottle-fed baby (with water at 0.7 ppm) drinking 800 ml a day would get $0.7 \text{ mg/L} \times 0.8 \text{ Liters} = 0.56 \text{ mg/day}$. This is $0.56/0.00315 = \text{approx } 180$ times higher than the safe level to protect against lower IQ.

A bottle-fed baby (with water at 1.2 ppm) drinking 800 ml a day would get $1.2 \text{ mg/L} \times 0.8 \text{ Liters} = 0.96 \text{ mg/day}$. This is $0.96/0.00315 = \text{approx } 300$ times higher than the safe level to protect against lower IQ.

So whether by accident or by evolutionary “design” mothers' milk is protective against lowered IQ but formula made up with fluoridated water (0.7-1.2 ppm) is not. The latter delivers a daily dose of fluoride, that is a factor of 180-300 times too high for a 7 kg baby.

C.6) Osteosarcoma: politics versus science

This is another issue to which Ken has not responded. It also one of the 10 “Ugly Facts,” which I feel should have ended the fluoridation experiment. This ugly fact occurred in 2001 when Elise Bassin, a dentist completing her doctoral thesis at the Harvard Dental School, found in a carefully conducted matched case-control study, that young boys exposed to fluoridated water (at 1 ppm) in their 6th to 8th years had an associated 5-7 fold increased risk of succumbing to osteosarcoma. Osteosarcoma is a rare but frequently fatal bone cancer.

Her study was first hidden (politics) from the public and scientific community, but was eventually published in 2006. Despite published promises from her thesis adviser that his larger study would refute her finding (politics), his study when it was finally published in 2011 entirely failed to do so (Kim et al., 2011).

So what we have here is an *unrefuted* study that indicates that a *few* young boys may be losing their lives by drinking fluoridated water. I am really amazed that promoters of fluoridation can take this issue so lightly. The small number involved should not justify turning a blind eye to this. As John Colquhoun asked in my videotaped interview with him in 1997 how much tooth decay saved would be an adequate exchange for “one death of a teenage boy from osteosarcoma”<http://fluoridealert.org/fan-tv/colquhoun/>

I am also disturbed that the Pew Charitable Trusts (a multibillion dollar foundation that is actively campaigning in support of fluoridation) would mischievously claim that the Kim et al (2011) study has put the matter to rest when it clearly has not.

The issue of fluoride and osteosarcoma has a long and fascinating history. There is a lot of politics involved, which is not surprising because if this connection was proven it would spell the end of fluoridation. We go into this sixty year history in some detail in Chapter 18 of our book, *The Case Against Fluoride...* A timeline can be found on the FAN website at <http://fluoridealert.org/studies/cancer05/> where full citations of the references can be found. Space forbids including it all here so we will jump to 2001.

2001. Even though Bassin’s thesis advisor Professor Chester Douglass had signed off on her thesis, in the three years that elapsed after her research was successfully defended he did not inform his peers, the NRC panel or his funders of this dramatic finding (politics). Instead he kept insisting when asked that his “own” study found no relation between osteosarcoma and fluoridation, without indicating that his own graduate student had found the opposite to be the case (and with better methodology).

Douglass knew of course that if this connection between fluoridation and osteosarcoma was established it would end fluoridation, and stated as much in a paper he had co-authored ten years earlier (McGuire et al., 1991).

2005. Eventually Bassin’s doctoral thesis was found in one of the Harvard libraries in 2005. The Environmental Working Group charged Douglass with academic misconduct for hiding this finding and asked the NIH (which had funded the study) to investigate. The investigation was handed over to Harvard. A committee appointed by the Harvard Dental and Medical Schools investigated the matter and in a short 4-paragraph statement exonerated Douglass, finding that he did not “deliberately” hide these findings. Harvard refused repeated requests for them to provide the basis for this decision.

2006. Bassin’s findings were finally published in the journal *Cancer Causes and Control* (Bassin et al., 2006). In the same issue of the journal a letter was published from Douglass that stated that his larger study would show that Bassin’s thesis did not hold

(Douglass and Joshipura, 2006). Douglass told the NRC panel that this larger study would be available in the Summer, 2006. But it did not appear for five years.

Meanwhile, Douglass' promise of a study *in a letter* was used by the NHMRC (2007); Health Canada (2011) and health authorities in the UK as if it was an actual peer-reviewed and published study (more politics).

2011. Eventually the Douglass paper was published in 2011, but oddly enough not in a cancer journal but in a *dental* journal, although it had nothing to do with teeth (Kim et al., 2011). The study has many weaknesses, but the key fact is that it did not refute Bassin's findings. Nor could it possibly do so. Because the biometric of exposure was the accumulated fluoride levels in the bones. As the authors themselves admitted, there is no way such levels could be used to determine the exposure to fluoride during the critical *age window of vulnerability* found by Bassin (the 6th to 8th years).

Conclusion: a well-researched study found a possible relationship between exposure to fluoridated water – at a specific age range in young boys – and a rare but frequently fatal bone cancer. Despite promises to the contrary, which were greedily gobbled up and repeated ad nauseam by promoters and supporters of fluoridation, this study has never been refuted.

It may be that fluoridation is killing a few – not many – young boys each year from this cancer. This is not fearmongering on my part. It is the current state of affairs as far as legitimate scientific research is concerned.

As with the lowering of IQ we are talking about serious albeit unproven risks here. When even prominent promoters of fluoridation have acknowledged that the *predominant* benefit of fluoride is topical and not systemic (CDC, 1999 and 2001), it remains puzzling – at least from a scientific point of view – why promoters are willing to take these risks. Especially, when it is clear that tooth decay is being reduced in the vast majority of countries that fluoridate neither their water, nor their salt, nor their milk.

There are alternatives, including education on dental hygiene, education for better diets (especially pregnant women and young children) and targeted topical treatments for the most vulnerable populations as currently being practiced in Scotland.

Part D

Here I address some of the issues presented in Ken's Final Posting *Ken Perrott's closing response to Paul Connett? December 30, 2013* not covered in Parts A-C.

Ken's comments are in bold and blue.

D.1) Correcting some misrepresentations

This is Ken's title for a super-gish-gallop of complaints and accusations, some trivial, some contentious, some correct and a few that raise important issues. Some deserve or require

response. It seems rather a pity to end the exchange, which in some ways has been interesting and informative on such a ding-dong and largely negative note. I shall try to conclude with something a bit more positive.

D.2)...I would be perfectly happy to see New Zealand switch to fluoridated salt.

Certainly fluoridated salt would be an improvement over fluoridated water because it would give citizens a choice on whether they wanted to increase their ingestion of fluoride or not

D.3) *“Maybe the most empathetic solution is that society as a whole compensate this small number of people [who have increased sensitivity to fluoride, PC] in some way to aid them with their predicament.”*

I am sure that those with this predicament are grateful for Ken’s empathy but probably believe, like I do, that the chances of the NZ government compensating them for a condition it does not recognize and is not willing to study is next to nil. So perhaps he might agree that a better way to relieve their symptoms would be simply to stop fluoridating the water.

D.4) Paul criticises public funding of an information service in New Zealand set up specifically to facilitate a “weighted evidence approach” towards fluoridation research.

My concern here is the use of taxpayer money (about 1 million dollars) to support the promotion of fluoridation rather than presenting a balanced view of the evidence. Yes, I was confused by the similar names; my mistake.

The citizens of NZ have reason to be grateful that a counterbalancing site has been set up. Its mission statement is worth reading because it clarifies why it came into being and how the organizers perceive their role:

“The New Zealand Fluoridation Information Service has evolved from frustration that useful, factual information about fluoridation has become almost impossible for the public and even professionals to sort out. NZFIS’ main goal is to facilitate full public and scientific examination of this public policy, which has become obscured by biased or inept media treatment (or lack thereof), by political rhetoric, and because of the obfuscation surrounding important information.

Probably the best that independent people can do, who are interested in this controversial issue, is to read the material on both sites and make their own judgment.

D.5) Paul is still confused about the graphic I introduced early in this exchange showing data for fluoridated and unfluoridated areas of the Irish Republic.

My apologies. I should have checked back.

D.6) He (Paul) has already lost that argument (about fluoridation cessation studies not leading to increased tooth decay) and he is desperately clutching at his remaining straws...

I have acknowledged that Ken had raised some valid arguments pertaining to the effects of ending water fluoridation but he takes this a little too far. Here is the background: proponents have argued that ending fluoridation would be a disaster as far as tooth decay was concerned. We have cited four modern studies that indicate that tooth decay did not increase when fluoridation was halted in Cuba, former East Germany, Finland and British Columbia, Canada.

Ken responded that in two of these studies other measures were taken which might have explained why tooth decay did not increase. I in turn argued that if this was the case it shows that there are alternatives to fluoridation that work, removing the need to force this practice on people who don't want it.

In checking one of the other studies from British Columbia (Maupomé et al, 2001 and Clark et al, 2006) I came across a study commissioned by the City of Toronto Public Health Board. This study examined the very issue of what would happen if fluoridation was ceased in Toronto (Azarpazhooh, 2006) and in the process carefully examined all the cessation studies available at that time. I think you can gauge from the fact that this pro-fluoridation board would not publicly release this report, that the results were not favorable to a pro-fluoridation position. After a great deal of effort the group *Canadians Opposed to Fluoridation* finally obtained this report and it can be accessed from their site.

<http://cof-cof.ca/2006/08/azarpazhooh-oral-health-consequences-of-the-cessation-of-water-fluoridation-in-toronto-msc-thesis-report-faculty-of-dentistry-university-of-toronto-city-of-toronto-public-health-2006/>

D.7) He (Paul) again avoids the importance of including social good in ethical considerations of social health policies like fluoridation.

I have no problem with entertaining the idea that a social good may over-ride individual preference (e.g. seat belts are a good example, and so is smoking in public). But I do not think that this notion applies in the case of water fluoridation. For those like Ken who believe it does, there are three hurdles in my view that they have to cross.

If they wish to force a practice on the whole population, against the express wishes of many, they *at least* need to demonstrate three things:

a) They must be sure that the good they are attempting to achieve is substantial and has been demonstrated with near certainty. We agree that no RCTs have been done to establish certainty and I think we may agree that the effect found in less rigorous studies has not, since the advent of fluoridated toothpaste, been all that impressive in absolute terms.

b) They must be sure that the good they are trying to achieve outweighs any harm that it may cause. In this case we have the undisputed increase in dental fluorosis, which can cause psychological harm when it reaches the moderate and severe levels, as well as being very costly to treat. In addition we have several distinct *risks*, which – largely due to a lack of will to seek evidence to corroborate or disprove them – should be seriously considered. These include impairment of brain development and IQ; long term bone damage including some forms of arthritis; small increases in cancer deaths due to fluoride itself or arsenic

contamination of the fluoridating chemicals; and (cf D3 above) production of sensitivity reactions in some individuals.

c) They can demonstrate that there are no other cost-effective approaches that can achieve the same aims (primarily the reduction of tooth decay among low-income families). This is hard to demonstrate because many countries have achieved the same reduction in tooth decay without fluoridation. And I have also cited the targeted Scottish program, which appears cost-effective and has achieved remarkable results with the children of low-income families using fluoride only for topical application.

I think it is fair to say that none of the three hurdles has been cleared or even seriously attempted during this debate.

D.8) Paul's emotional (or political) obsession with individual choice often comes though in the most unlikely places. Why should he use the term "forced fluoridation" in a polite scientific exchange?... There is always a choice for those prepared to make the effort to satisfy their convictions.

Ken objects to the "impolite" word "forced" in connection with water fluoridation. Okay, someone like me, or like him I guess, living in a fluoridated community can install a reverse osmosis filter (expensive), avoid eating out or visiting friends (restrictive) and refrain from eating prepared foods (hmm). But let's see what "forced" means to low-income families who are supposedly the main beneficiaries of the program. They can't necessarily afford bottled water for drinking and cooking, and they can't afford reverse osmosis units. They are trapped by this program. If these families do not share Ken's belief that this program is doing them good, and may even be causing them harm, there is little they can do.

If these same families cannot afford bottled-water to make up baby formula, then they may be forced to give their babies about 200 times more fluoride than nature provides. In this situation they are worse off than children from middle-income and higher-income families because fluoride's toxic effects strike hardest on those with poor nutrition, low calcium, low protein, low vitamins and low or borderline iodine.

Let me introduce an idea about fairness into this discussion: the idea of "disproportionate imposition." Clearly if you remove fluoride from the community's water supply or add it, you are going to make some people happy and others unhappy. But let's look at the "disproportionate imposition" involved here. For those who don't want it – and it is added – they have to go at the least to the expense and inconvenience that I have discussed above. At the worst, they may be unable to avoid it at all. In contrast, those who do want it – and it is removed from the public water supply – merely have to content themselves with fluoridated toothpaste, which they are probably using already – if they insist on ingesting fluoride they can drink fluoridated bottle-water or take sodium fluoride tablets.

I think the imposition to both sets of people is dramatically different. Thus at the very least – and on top of all the other arguments – this practice is unfair because of this disproportionate imposition factor. The idea that fluoridation is a social good is quite fallacious.

D.8) I am surprised Paul has taken the approach of blaming practically every illness or change on fluoride.

I do not do this and we didn't do it in our book. But it is a standard technique used by proponents of fluoridation. They ridicule the position of the opponents of fluoridation by claiming that we assert that every disease known to man is caused by fluoride. They sometimes include nymphomania, which is an invention entirely of their own making, to add to the ridicule.

Certainly there are some specific health concerns, most of which have been discussed at some length in this exchange. Those concerns deserve to be taken seriously because there are scientific reasons for postulating that fluoride may be involved in some way and to some extent in their pathogenesis. The case for investigating them is much enhanced by the fact that millions of people are having their total fluoride exposure increased by fluoridation. Ken goes on to list these concerns, though he doesn't really need to at this stage, but then he just dismisses them as a mere tactic of non-scientific activists! Later he drags obesity into the discussion and his argument, if there is one, then becomes unintelligible to me. But let's just look at the first on his list: arthritis.

Arthritis is of concern because the first symptoms of fluoride's poisoning of the bone in endemic fluorosis areas are symptoms just like arthritis. We have argued that with arthritis reaching epidemic proportions in several fluoridated countries it would be a responsible thing for health agencies there to investigate whether there is any relationship between long-term exposure to fluoridated water and increased arthritis risk. It is not an unreasonable hypothesis. It is testable and one can reasonably argue that it should be tested. No fluoridated country has done so. I don't think anyone is naïve enough to claim that all arthritis is associated with fluoride. Certainly I would never advocate anything so silly.

[D.9\) Paul insists on using the authority fallacy – out of context quotations from authoritative figures.](#)

An example in his last article was that by David Locker. Perhaps he is not aware he is doing this – it seems to be an instinctive reaction for anti-fluoridation activists. He should appreciate that the world is never as simple as implied by such quotes. I see his resort to such fallacies as a weakness, not a strength.

I often quote the late David Locker. It is interesting that he, who has been pro-fluoridation reached a similar conclusion to my own, namely that today there seems to be not much of a significant benefit that can be associated with fluoridation (e.g. Brunelle and Carlos, 1990) or ingesting fluoride (e.g Warren et al., 2009).

For those who would like to see more of David Locker's views on this subject I would encourage them to view a TV program featuring a three-way debate/discussion featuring David, myself and a representative of the Canadian Dental Association. The program (22 minutes in length) is a little rushed but still shows that you can have a civilized discussion on

this with people who fundamentally disagree. <http://fluoridealert.org/fan-tv/water-fluoridation-medical-hot-seat-debate/>

I think David by occupying a middle position was key to the success of this program. Sadly he has since passed away at far too young an age.

It is ironic that Ken should complain about “anti-fluoridation activists” quoting authoritative figures because that strategy has been absolutely central to the promotion of fluoridation since the 1950s. They have used an endless list of endorsements from professional bodies, surgeon generals, Benjamin Spock, US Presidents – you name it. All this as a substitute for actual science!

D.10) Nature of Fluoride Action Network

If Ken wants to play pro-fluoridation activist rather than scientist, that’s fine by me.

He may convince himself and the rest of the world that FAN is a terrible organization, but that does not affect the scientific cases for and against fluoridation, which is what this debate is supposed to be about.

However I do urge readers, rather than taking Ken’s views of FAN at face value, to go to our homepage at (www.FluorideAlert.org) click on “researchers” top right, explore from there and draw their own conclusions.

PART E. Summary: The Key Arguments Against Fluoridation

Based upon all the above I believe that my key arguments against fluoridation remain largely untouched. Here they are again.

E.1) Fluoride is not an essential nutrient. There is no need to swallow it or put it in the drinking water.

E.2) It is bad medical practice – you cannot control the dose or who gets the fluoride. It goes to everyone, for a lifetime with no individual monitoring for side effects or the accumulated dose in the bones.

E.3) It is an unethical practice – you are forcing fluoridation on people who don’t necessarily want it.

E.4) It is a reckless practice. It is reckless for several reasons but particularly because it involves giving bottle-fed babies about 200 times more fluoride than breast-fed babies.

E.5) The evidence that swallowing fluoride reduces tooth decay significantly in today’s conditions is weak. Ken failed to address the many epidemiological studies that I cited (and we discussed in our book in chapters 6-8), most of which were conducted by pro-fluoridation scientists or pro-fluoridation agencies, that suggested that very little absolute benefit comes from swallowing fluoride. I singled out two studies. These were the studies by Brunelle and Carlos (1990) and Warren et al. (2009).

Both these studies were funded by the US taxpayer and both were conducted by pro-fluoridation researchers. So if there were any bias involved it would not have been in favor of the anti-fluoridation position. One study was very large and the other was small but very precise in its scope and nature.

Brunelle and Carlos (1990). This was the largest survey of tooth decay ever undertaken in the U.S. The teeth of 39,000 children from 84 communities were examined. The authors compared the Decayed Missing and Filled Surfaces (DMFS) for children who had always lived in a fluoridated community with children who had never lived in a fluoridated community. The average difference in tooth decay of the permanent teeth was 0.6 of one tooth surface and even this small saving was not shown to be statistically significant.

Warren et al., (2009). This study was part of the U.S. government funded “Iowa Study” where children’s tooth decay has been tracked from birth. The authors were attempting to find the so-called “optimal dose” needed by a child to reduce tooth decay. But they couldn’t find that dose. In fact, they could not find a clear relationship between tooth decay and the amount of fluoride ingested on a daily base. The authors concluded that, “These findings suggest that achieving a caries-free status may have relatively little to do with fluoride intake...”

E.6) Those countries in Europe that have opted not to fluoridate their water or their salt show little evidence that this decision has ruined their children’s teeth.

Ken argues that even though they don’t have fluoridated water, many use fluoridated salt and milk. In actuality, the majority of European countries fluoridate neither their water nor their salt. The only country that still has even a small amount of fluoridated milk in a few schools is the UK. Bulgaria and a few other former-communist countries experimented with fluoridated milk, but it has never been given to more than a miniscule percentage of European kids. Furthermore, with both fluoridated salt and fluoridated milk you are offering the individual a choice in the matter.

These countries have found alternative ways of fighting tooth decay, which do not involve forcing people to swallow fluoride who don’t want to. Those alternatives include early education for better dental hygiene, better diets, reduced sugar consumption, and targeted preventive measures (including topical treatments) for children from low-income families.

E.7) The admission by leading promoters of fluoridation like the CDC (1999, 2001) that the predominant action of fluoride is topical not systemic probably explains the findings in both E.5) and E.6) above.

E.8) There is a growing amount of evidence emerging that documents health effects at levels which offer no adequate margin of safety to protect everyone drinking fluoridated water, including the potential to lower IQ.

In the case study margin of safety analysis for lowered IQ (see C.4), I estimate that to protect every child drinking fluoridated water at 1 ppm, he or she should drink no more than 9 ml of water. The same analysis indicates that a breast fed baby is just about at the safe level to

prevent lowered IQ, but a bottle fed baby will be getting 180 – 300 times above the safe level if its formula is made up with water at 0.7 and 1.2 ppm respectively (see C.6).

E.9) There is an unrefuted study that young boys drinking fluoridated water in their 6th to 8th years have an associated 5-7 fold increase of succumbing to osteosarcoma by the age of 20. As this rare bone cancer is frequently fatal, it is a shocking but real possibility that several young boys may be killed by this practice each year.

E.10) Since the U.S. Public Health Service endorsed water fluoridation in 1950 very little serious scientific attention has been directed into investigating both short and long term health effects of ingesting fluoride. Inexplicably the U.S. Food and Drug Administration has never regulated fluoride for ingestion and its official classification of fluoride is an “unapproved drug.” The U.S. National Research Council review of 2006 reveals many important but unanswered questions about ingested fluoride. The NRC also concluded that certain subsets of the population are exceeding the EPA’s reference dose for fluoride (the IRIS level) drinking water at 1 ppm fluoride; this includes bottle-fed infants and people with poor kidney function. The NRC recommended that the EPA Office of Water perform a new risk assessment to determine a new and safer MCLG (maximum contaminant level goal) for fluoride in drinking water. After nearly 8 years this new risk assessment has not been done. If determined honestly a new MCLG would almost certainly force an end to water fluoridation. Politics not science is keeping this practice afloat in the U.S.

Overall Conclusion. It is time to end water fluoridation worldwide. The very small and questionable benefits do not justify the huge risks being taken. New Zealand would be a good place to start the process. If it did so it would not make the U.S. health agencies that have doggedly promoted this practice for over 60 years very happy. However, NZ has shown itself capable of bucking the tide on other international issues in which the U.S. has held a strong contrary position. It would be refreshing for at least one fluoridating country to admit that it has made a mistake with this policy and set out to return scientific integrity to the center of its public health policies.

I thank Ken for sharing this debating platform with me. Of course we have disagreed on many things, which one would expect in any debate –but hopefully readers of all persuasions will have found enough to engage their interest.

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Final article – Ken Perrott - 23 January 23, 2014

“Skeptical scrutiny is the means, in both science and religion, by which deep thoughts can be winnowed from deep nonsense.”— Carl Sagan

Paul has used his right of reply and it really is time to close off this exchange.

I am not going to sieve through Paul’s long article and comment point by point – we are well past this. Instead I will discuss a basic issue central to the exchange (Paul’s reference to “*weight of evidence analysis*”) and show with several examples how superficial, and unscientific, Paul’s understanding of the approach is.

“Weight of evidence” – different things to different people

Weight of evidence can mean anything from a vague metaphorical description to a methodological approach or a theoretical/conceptual framework. Paul doesn’t clarify any further, but when he talks about balancing one set of studies or papers against another I find his concept very mechanical. It reminds me of the way the Hamilton City Council treated the submissions to last year’s hearings on the fluoridation issue (see my article *When politicians and bureaucrats decide the science*). Council staff reported:

“Of the 1,557 submissions received 1,385 (89%) seek Council to stop the practise of adding fluoride to the Hamilton water supply. 170 (10.9%) seek Council to continue the practise of adding fluoride and 2 (0.1%) submitters did not indicate a stance.”

Council, and Council staff, were impressed by these numbers – after all, place the submission printouts on a kitchen scales and of course the anti-brigade wins! Silly, I know, but this was one of the arguments staff supplied to council for ignoring the result of the referendum (where almost 70% supported fluoridation), at their November 2013 meeting. This extract from the draft resolution submitted by staff:

“All evidence has been considered carefully by Council and, while finely balanced, Council preference is to continue not to fluoridate the city water supply because: . . .

vi. Not fluoridating the city water supply reflects the majority of views expressed through the Council tribunal process.”

The silliness of such an approach is obvious when one starts to consider the **quality** and not the **quantity** of submissions. Here are a few examples from those opposing fluoridation:

Submission No 58:

I do not believe there is enough evidence to support the mass medication of our water supply's for the good of all people. It is our right to choose to medicate ourselves with fluoride not the government right to force this medication I believe the fluoride in our water is toxic and needs to be stopped.

Submission 60:

Water Fluoridation is medication - even if the pro fluoridationist say it is not. Council does not have the right to medicate the water. Please STOP!

Submission No 61:

From what I have come to understand, Fluoride is a toxin that has been and will continue contribute to chronic long term health illnesses. Fluoride a toxic substance we don't want in our water supply for our younger generation to be exposed to.

Regards Connie

Submission No 65:

"I do not want NO KEMICALS into my drinking water.Thank you very much,Dorel"

Submission No 975:

"There is no acceptable reasoning to mass dose the whole population. There is a significant amount of information describing the side effects of Fluoridation of the water supply. If people want extra Fluoride then they can take tables. 90% + of the fluoride added to the town supply ends up in the environment. There are more than 100 pesticides manufactured from Fluoride."

Submission No 237:

"I love New Zealand, it's such a beautiful country. Fluoride is not necessary in the water supply. Please let people make their own choice about whether or not they want to ingest fluoride. It should not be forced upon anyone by adding it to the water supply. This is just plain and simply wrong!"

The local anti-fluoride activist organisation, the Fluoride Action MNetwork of NZ (FANNZ), promoted such meaningless submissions by providing a template form for their supporters. They were going for quantity and not quality – they are political activists, not scientists.

This shows why I reject the mechanical “weight of evidence” approach Paul often seems to be advocating. He certainly fights hard to avoid consideration of the quality of evidence he uses.

I can only agree with a “weight of evidence” approach if it is qualitative, not simply and mechanically quantitative. In fact, I would avoid the term and instead say our approach should be a balanced one, looking (as far as practicable) at **all the evidence and considering it critically and intelligently.**

Hence the quote from Carl Sagan at the head of this article.

I don't think Paul does this. I show this in my comments and responses below.

From logical possibility to conspiracy

Paul's book, *The Case Against Fluoride*, provides clear examples of a formula he uses to cast doubt on existing science, build up a library of claimed negative effects of fluoride in the human body and to suggest the scientific community conspires to suppress research findings and prevent important research from going ahead. It's the sort of stuff ideologically driven opponents of fluoridation lap up enthusiastically. These tactics are not new – we have seen it all before with the creationists and the climate change deniers.

This formula has 3 steps:

1: Advance a claim with no real evidence. This can be done in several ways.

A): Establish a logical possibility. Paul uses a lot of “possibles,” “mays,” etc., in his book. No research evidence at all is required for this – just speculation and suggestion. For example:

“ . . . if fluoridation were to increase the rates of hip fracture in the elderly, it would be serious and certainly grounds in itself to eliminate water fluoridation.” (p174).

“ . . . a possible mechanism exists whereby fluoride could bring about an excessive production of TSH from the pituitary. This may help explain why . . . ” (p163).

“These speculations need to be investigated.” “Although more difficult to prove, it is reasonable to assume that many of the effects seen in vitro can occur in the whole body.” (p125)

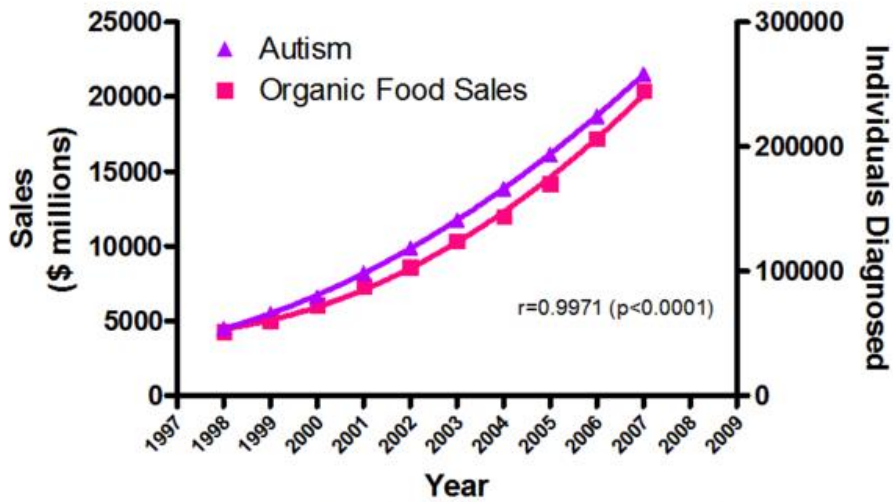
“The bone is the principal site for fluoride accumulation within the body, and the rate of accumulation is increased during periods of rapid bone development as occurs in growth spurts during childhood. Thus, the cells in the bone are exposed to some of the highest fluoride concentrations in the body.” (p182)

This last speculation is fallacious as fluoride exists as a structural component of the solid bioapatites in the bone – not in solution – so the term “concentration” is misleading.

B): Use poor research evidence. He often uses the old trick of implying a cause from a correlation, or using research papers who have relied on this fallacy.

The graph below illustrates the fallacy. Most of us find the suggestion eating organic food is the cause of autism silly and we are not at all convinced – despite the excellent correlation. Maybe there are a few people who are so hostile to organic food that they take this suggestion seriously – we can see how their bias might lead them to claim this as evidence and even promote their story with such figures.

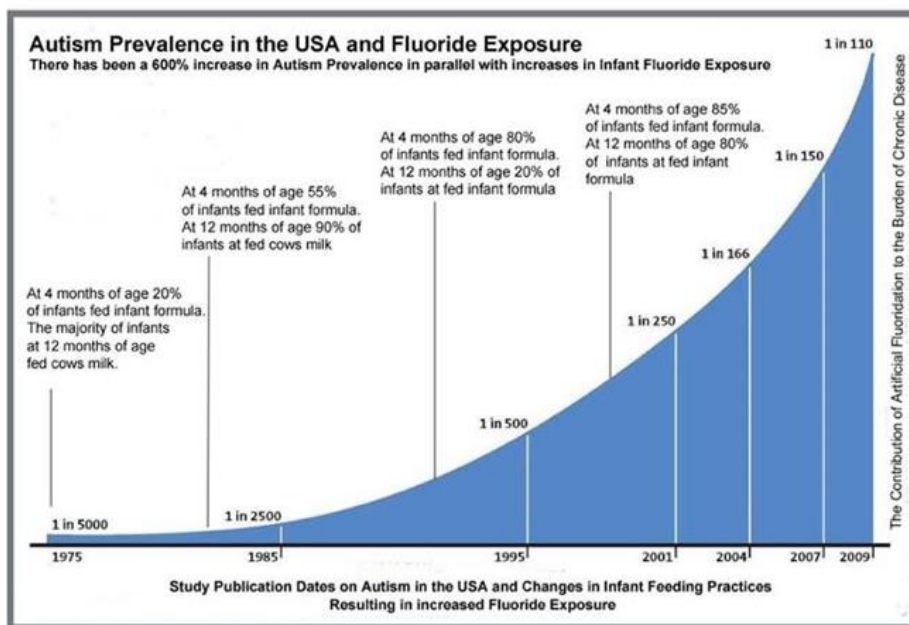
The real cause of increasing autism prevalence?



Sources: Organic Trade Association, 2011 Organic Industry Survey; U.S. Department of Education, Office of Special Education Programs, Data Analysis System (DANS), OMB# 1820-0043: "Children with Disabilities Receiving Special Education Under Part B of the Individuals with Disabilities Education Act"

But replace the organic food sales with a vaccination statistic – we have a demographic who serious believe vaccinations are harmful and would easily lap up such a fallacious figure. (We are getting a bit close to the bone here – Paul’s Fluoride Action Network (FAN) is organisationally aligned with anti-vaccination ([National Vaccine Information Center](#)), anti-GM ([Institute for Responsible Technology](#)), and similar outfits through the [Health Liberty Coalition](#).)

Now do the same with a fluoridation statistic and we are getting into very familiar territory. Think Declan Waugh and his graphs showing correlations between fluoridation and practically every illness known to humanity. In fact, Declan Waugh is doing this for autism on his [Facebook page](#). Here is his graph.



Another approach is to just rely on poor quality research – selected to fit his desired conclusions. Consider Paul’s obsession with poor quality Chinese research papers showing a negative correlation of IQ and fluoride concentration in drinking water. These studies have problems with IQ measurement and confounding factors. How can one seriously claim causation when the studies don’t consider, for example, detailed analysis of education and family social conditions. Or other more important contaminants in the environment,

Paul sort of **admits speculation or reliance on poor quality research** but quickly leaves his admission behind in his eagerness to claim harmful effects:

“there are about twenty studies (albeit with questioned methodologies in some cases) suggesting potential damage to the brains of young children” (p156).”

“Although the validity of the scoring methods used for fractures is acknowledged by the authors to be questionable, this is a potentially important finding,” (p170)”

“At present there is no direct and unassailable proof that fluoridation per se harms anyone’s thyroid. This may be due to the paucity of studies conducted;” (p164)

“We emphasize that proof that fluoride acts on the thyroid in these ways in vivo is still lacking. Further research is needed, but, meanwhile, the mechanisms are plausible and based on existing science.” (p163).

“Although there is no direct evidence that fluoride can inactivate deiodinases, it is well known as an inhibitor of many enzymes, and the hormonal derangements reported in fluoride-exposed people have been interpreted in terms of effects on deiodinases.” (p162)

Paul builds his arguments on very flimsy foundations. He often admits as much but attempts to confound his readers with a fair bit of hand waving and Gish galloping.

2: Collect together any sources which can be interpreted to support the speculation. This may often need a bit of dredging – obscure journals or newsletters, comments recorded at meetings, foreign language sources, etc. Here a naive mechanical “weight of evidence” approach is useful as a pile of Byelorussian, Chinese, Indian, etc. papers from obscure or poor quality sources, often newsletters or reported statements and not scientific papers, weigh a hell of a lot more than one or two papers from reputable journals, by reputable research teams, who report contrary findings.

And of course the well-known problem of lack of reporting negative effects weighs in at zero.

Paul is very proud of the 80 pages of citations in his book. But many of them are repeated several time, are from sources not normally considered for scientific citation, or from sources difficult to track down. Very many of the citations are to his own activist FAN web site. A particularly disturbing aspect of the last sources (often used when referring to translation of foreign language material) is that very often the links lead nowhere. They have either been lost during web site reorganisation or may never have even existed. Who is to know?

3: Use the lack of reputable sources for his claims as evidence of a conspiracy. Paul can “double dip” with the “missing” research and publications from credible research teams and journals. He records paucity of evidence from credible sources to support his own claims relying on poor quality sources, then implies the lack of material indicates at least an unwillingness to research problems or at worst a conspiracy not to do the research and/or hide the results. Of course such descriptors of unwillingness or conspiracy can also be turned on researchers or publications with contrary evidence. He can discount them by suggesting links with industry or personal bias – hence introducing a sort of negative quality to good research while refusing to allow judgement on the quality of the bad research.

For example:

“Most of the concerns about the immune system are largely speculative; once again the scarcity of literature on this reflects a lack of interest by governments that promote fluoridation. The same can be said about reproductive effects; despite an extensive literature indicating that, at high levels of exposure, effects of fluoride on the reproductive system have been observed in a wide range of animals and reptiles, very few human studies on the subject have been published or even undertaken.” (p197)

“The failure to explore the plausible connection between fluoridation and arthritis in any fluoridating country is difficult to understand. It is particularly surprising since the causes of most forms of arthritis (e.g., osteoarthritis) are unknown but are usually associated with the aging process. For those living in fluoridated communities the aging process will coincide with lifelong accumulation of fluoride in their bones and joints.” p170/171)

“We do not claim that these IQ studies add up to conclusive evidence that water fluoridation impairs cognitive development. . . . it is wise to sit up and pay attention. The health authorities and governments of fluoridating countries show little sign of doing that.” (p156)

“A small minority of people, perhaps 1 percent, appear to be acutely sensitive to exposure to fluoride at the concentrations present in fluoridated water. The wide range of signs and symptoms resemble those seen in poisoning with larger amounts of fluoride. These findings date from the 1950s. However, far from leading to more extensive studies, they were ridiculed when introduced and have since been largely ignored.” (p136)

Fluoridation and IQ

Paul’s mechanical and selective understanding of “weight of evidence” sticks out like a sore thumb when he claims fluoride influences development of the child’s brain. Even though he notes the mainly Chinese studies he relies on had “questioned methodologies in some cases” (p156 of his book) this is perhaps his most favourite claim for rejecting fluoridation. In his [last article](#) he even spent some time developing a margin of error from the studies – rather previous, I think, as he had not established that the data he used was reliable or indicated causation

The European Scientific Committee on Health and Environmental Risks (2010) took a more intelligent and critical approach to the Chinese studies. This from their document *Critical review of any new evidence on the hazard profile, health effects, and human exposure to fluoride and the fluoridating agents of drinking water:*

“A series of studies on developmental effects of fluoride were carried out mostly in China. They consistently show an inverse relationship between fluoride concentration in drinking water and IQ in children. Most papers compared mean IQs of schoolchildren from communities exposed to different levels of fluoride, either from drinking water or from coal burning used as a domestic fuel. All these papers are of a rather simplistic methodological design, with no – or at best little – control for confounders, e.g., iodine or lead intake, nutritional status, housing condition, parent’s education level or income.”

This document concluded:

“Available human studies do not allow concluding firmly that fluoride intake hampers children’s neurodevelopment. A systematic evaluation of the human studies does not suggest a potential thyroid effect at realistic exposures to fluoride. The absence of thyroid effects in rodents after long-term fluoride administration and the much higher sensitivity of rodents to changes in thyroid related endocrinology as compared with humans do not support a role for fluoride induced thyroid perturbations in humans. Limited animal data cannot support the link between fluoride exposure and neurotoxicity, noted in the epidemiological studies, at relevant non-toxic doses. SCHER agrees that there is not enough evidence to conclude that fluoride in drinking water may impair IQ.”

The NZ National Fluoridation Information Service (2013) also critically reviewed literature on this issue (see NFIS Advisory A review of recent literature on potential effects of CWF programmes on neurological development and IQ attainment). They concluded:

“The available evidence raises the possibility that high levels of fluoride in drinking water may have subtle effects on children’s IQ. However all of these studies have limitations in design and analysis, a clear dose-response relationship between DWFCs and assessed IQ are often not evident. The study authors are frequently very cautious in their comments, and several noted that any indicated negative effect applied only to high DWFCs. An hypothesis of fluoride neurotoxicity would also be supported by some experimental animal studies, however the great majority of these have only considered high fluoride intakes.

However collectively the data described are not robust enough to draw a firm conclusion that high fluoride levels in drinking water supplies contribute to retarded development of children’s brains. Also there is no clear evidence to suggest an adverse effect on IQ at lower fluoride intakes such as that likely to occur in New Zealand, where fluoridated water supplies contain fluoride in the 0.7 to 1.0 mg/L range.

Thus the balance of current scientific evidence does not suggest any risk for the development of full IQ potential for New Zealand Children from current community water fluoridation initiatives, where maximum DWFCs are 1 mg/L.”

Paul will respond that the studies were good enough to warrant further investigation but then he alleges that western researchers are either willfully ignoring these studies or even conspiring to suppress them and refuse to investigate further.

He never considers that, perhaps, the lack of better quality studies really is evidence of lack of effect – given the reluctance to publish studies with nil results.

Think about it, if there really was this effect from salt, milk or water fluoridation wouldn't we be aware of it by now? After all, many countries do collect the sort of data about their populations, especially children, which would show any effect.

Maybe publication of the [Choi et al \(2012\)](#) meta-review will encourage more specialists to extract this data in their own countries and publish analyses. I personally know of one such study in New Zealand which shows no IQ effect of fluoridation. This study is of higher quality than the ones Paul relies on because the data was sufficiently extensive to allow consideration of confounding effects (eg. breastfeeding, education, income level, etc.). A paper has recently been submitted for publication so unfortunately I cannot offer a citation until it is "in press."

Osteosarcoma

Again, the importance Paul gives to a single study on fluoride and osteosarcoma illustrates his mechanical and selective approach to "weight of evidence." He has not bothered including either the study by [Comber et al \(2011\)](#) of this issue in Ireland or the study by [Levy & Leclerc \(2012\)](#) for the US. Possibly because both of these concluded that water fluoridation has no influence on osteosarcoma incidence rates.

The NZ National Fluoridation Information Service (2013) briefly considered this literature and cancer incidence rates for New Zealand (see [Community Water Fluoridation and Osteosarcoma – Evidence from Cancer Registries](#)). Their conclusion:

"The analysis confirms that osteosarcoma is extremely rare in New Zealand with only 127 new cases registered during this period averaging 14.1 per year. The peak age is 10 to 19 years for both sexes. These rates indicate that there is no difference in the rates of osteosarcoma cases between areas with CWF and areas without CWF for both sexes, findings which are consistent with the two international studies."

But, I guess, not consistent with the one study Paul relies on! A study Paul described as "unrefuted." See what confirmation bias does to "weight of evidence?" Although his "unrefuted" strangely conflicts with his qualification about this research in his book:

"The evidence that fluoride causes osteosarcoma is not clear-cut. The studies of the relationships in both animals and humans are mixed." (p 181)

Breast feeding and the naturalistic fallacy

I understand Paul's points about dose and dosage – they are not difficult concepts. Obviously they are important when we consider ingestion of fluoride and other environmental elements by infants. My reading indicates that those involved in health advice and regulation do consider dosage when discussing fluoride. I am at a loss to know why Paul thinks this issue is being avoided.

Paul keeps returning to the low level of fluoride in breast milk so I can't help think he is still trapped by the naturalistic fallacy. He even links this to IQ claiming "*whether by accident or by evolutionary "design" mother's milk is protective against lowered IQ.*"

Paul may make some mileage out of the naturalistic fallacy if he stays with fluoride, but bring in the other trace elements which present problems because of deficient levels in human breast milk and the fallacy has far less credibility.

A brief scan of the literature shows breast fed children are prone to some microelement deficiencies. For example, [Kodama \(2004\)](#) and [Domellöf, et al \(2004\)](#) report deficient levels of zinc, selenium and iron in breast milk. Supplementation of breast-fed infants with micronutrients, including fluoride, is sometimes recommended.

Hastings project

Paul's treatment of this issue shows how simple his concept of "weight of evidence" is. He relies only on one-sided discussions by [Colquhoun \(1987\)](#), [Colquhoun & Mann \(1986\)](#), and [Colquhoun & Wilson \(1999\)](#). He seems not to have done anything to check the original papers from the project and relies on a single out-of-context letter from a bureaucrat which he interprets to his own satisfaction.

1. **Paul adamantly and publicly declares the Hastings fluoridation project a "fraud."** That is an extremely serious charge in the scientific community – scientific fraud is one of the worst accusations possible and usually leads to loss of career. It is unprofessional to make such a charge without being prepared to pursue it legally. I question the ethics of such an attack on people who are no longer here to speak in their own defense.
2. Paul says:
"What convinces me the final report was a fraud was the authors did not mention the change in diagnosis when claiming the drop in tooth decay was due to fluoridation."
 Yet he does not reference the "final report" or show any indication he has checked this charge rather than take it on trust from his anti-fluoridation sources.
3. He claimed in his [second to last article](#) that the decision to drop Napier as a control city was made for "*bogus reasons*" – yet gave absolutely no evidence to support such a serious claim. He now wants to avoid that responsibility by saying the issue (his claim) is a "*red herring*." Sorry Paul, one should not avoid responsibilities – if you wish to make a serious allegation be prepared to back it up or withdraw and apologise – not run away from it.

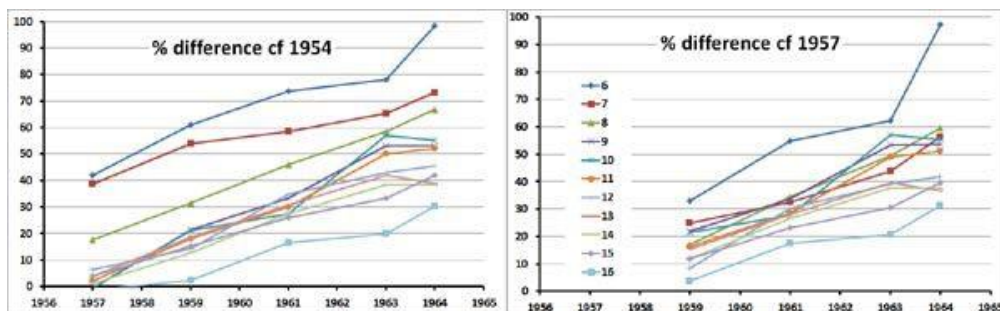
I know from experience the complexity of long term trials involving many people doing different jobs. It is easy to take a bureaucratic letter out of context, oversimplify or misinterpret problems of personal approaches to methodology and ignore the fact that managers of such trials inevitably face difficulties from factors outside their control. As for reporting findings, the data amassed and details of methodology and their changes can be mind-boggling for an outsider who attempts an understanding.

I will not pretend to have got my head around that project but here are a few observations:

1. The findings from the trial were presented as scientific papers in the New Zealand Dental Journal (Ludwig and Ludwig, et al. 1958, 1959, 1962, 1963, 1965, 1971). The issues with Napier, originally proposed as a control, are discussed by Ludwig et al (1960), Ludwig & Healy (1962) and Healy et al (1962). Paul does not seem to have consulted any of these papers yet he considers his “weight of evidence” enough to make serious charges of “bogus” and “fraud!”

The authors did not trumpet their study “*showed that fluoridation was a great success*” – scientists are usually more circumspect. In this case conclusions were more along the lines “*The results obtained in Hastings during a period of 75-78 month’s fluoridation are very similar to results obtained overseas after a comparable period of fluoridation.*” (Ludwig 1962).

2. The important data was reported in papers from 1958 – 1971. These are very brief but all include the statement that further information on methodology, data and statistical analysis is available to interested people. The details Paul’s seems to want may be in that unpublished “further information.”
3. Colquhoun & Mann (1986) and Colquhoun & Wilson (1987) both quote from unpublished reports and communications where discussion of diagnostics and methodological changes occurred. Colquhoun and Mann even report that researchers believed evidence from the Napier data indicates these changes did not have an overriding effect. Even a simple glance at the published data shows that the decline in tooth decay was not restricted to the early period where diagnostic and methodological changes would have been expected to exert any effect. Compare the plots below.



Hastings data shows similar improvement in oral health even if project had started in 1957. Plots are for different ages.

I think Paul is irresponsible to make such damning charges of “fraud” without considering all the material. He actually has no evidence at all the project was a “fraud” or that the reasons for dropping Napier as a control were “bogus.” His behaviour is unprofessional.

The problems with longitudinal studies

There are inevitable problems with longitudinal trials of the sort which the Hastings Project eventually became. They are influenced by undetected confounding factors and hence can be difficult to interpret. This may not have been sufficiently recognised at the time and that may have coloured interpretation of the results.

But let's not forget that much of the harsh criticism of fluoridation made by Colquhoun (1997) and Diesendorf (1986) rely on their own biased interpretation of such longitudinal trails. And today's anti-fluoridation propagandists make the same mistake even though we now know better. Paul himself used the WHO data showing improvement in oral health in many countries in his first few articles to argue that fluoridation had no effect. He did not consider the multifactorial causes of that improvement or mention that where measurements made in single countries (like Ireland) clear differences between fluoridated and unfluoridated areas were seen.

Should we now accuse Paul of “fraud” because he made no mention of the full Irish data in his claim that the WHO data showed fluoridation ineffective?

Paul continually avoids systemic role of fluoride

He does this by stressing the surface mechanism initiating caries is “topical” and not “surface” and works hard to imply “topical **application**” methods are required. He has conceded to including the word “predominantly” when referring to the surface mechanism but seems not to understand the meaning of the word.

My dictionary definition for “predominant” is “*Most common or conspicuous; main or prevalent.*” The word does not mean “*only*” as Paul seems to assume.

Neither is tooth decay simply about the initiation of caries. It also involves the strength and hardness of the teeth where systemic fluoride plays a beneficial role – especially during teeth development in the pre-eruptive stage. Paul continually avoids this as he also does the normal and natural role of fluoride in bioapatites.

Paul has not even acknowledged the citations I have given supporting this systemic function for fluoride. I guess all I can do is add another one – published this month - Cho, et al (2014). *Systemic effect of water fluoridation on dental caries prevalence.*

Paul's concessions

I guess we should acknowledge there has been some progress during this exchange as Paul has made a few concessions. It is worth recording them here to show they have occurred – but of course I am interested to see if he still repeats his original claims elsewhere.

Fluoridated and unfluoridated data for the Irish Republic. Finally Paul seems to understand my point on this. At least he apologises and said he should have checked.

I really can't understand why he was confused for so long (I raised it in my first article) but we all have our moments, I guess. He should now understand that use of WHO and similar data showing improvement of oral health in both fluoridated and unfluoridated areas is not a proof that fluoridation is ineffective. This fallacy is repeated again and again by opponents of fluoridation and ignores completely the multiple issues involved in oral health. Scientifically literate people should not resort to such fallacies.

I will be interested to see if he avoids this fallacy in future. A sign of good faith would be for him to remove or amend the section on the FAN website which promotes this fallacy.

Xiang et al's margin of safety calculation. I asked Paul several times to clarify this because he was using a figure of 1.9 ppm yet Xiang's paper was completely silent on how the value was obtained and seems to ignore the large variability of the data – another sign of poor reviewing by the journal *Fluoride*. Paul now seems to have walked away from reliance on Xiang et al (2003) and a threshold value of 1.9 ppm and wants to take a different approach.

But, he still wants to use the poor quality Chinese data and does nothing to justify using that data in the absence of demonstration of any causal, and not incidental, relationship between fluoride in drinking water and IQ. I think this makes his calculations meaningless.

In the meantime could he please remove the sections of his FAN website arguing for the 1.9 ppm margin of safety?

What happens when fluoridation is stopped. Paul has accepted my point that at least in the cases of the former DDR and La Salud, Cuba, the results are consistent with use of alternative fluoride sources such as fluoridated salt, mouth rinses and dental applications. While admitting I had a valid point he says:

“Ken responded that in two of these studies other measures were taken which might have explained why tooth decay did not increase. I in turn argued that that if this was the case it shows that there are alternatives to fluoridation that work.”

Two points.

No one claims there are no alternatives to fluoridated drinking water. I have pointed out again and again that there are. So why the red herring? Paul was citing these studies to “prove” fluoridation is ineffective and I showed his conclusions were not justified.

Paul appears desperate to cling to any case I have not looked at. Must I go through every example and look at the details? Can he not do this himself? If there are no mitigating circumstances this would surely support the argument he wants to make. We should not do science this way. We should always approach the literature and research critically and intelligently.

Having conceded on La Salud and the former DDR is he prepared to modify his claims about these situations in his FAN website?

National Fluoridation Information Service

Some discussion of this body is important as Paul's confusion extends a lot further than its name. He is demonstrating how he cynically uses terms like "weight of evidence analysis." Cynical because he rejects the very body (NFIS) that is taking this scientific approach in New Zealand and throws his advocacy behind the body which is biased, uncritical and unintelligent in considering the evidence. The body which cherry-picks literature and interprets it selectively to support its confirmation bias. He supports the NZ Fluoridation Information Service (NZFIS).

As I wrote in my last article the NZFIS is an astroturf organisations set up by the FANNZ. Paul well knows that FANNZ has a clear bias and political aims with a declared purpose of "*bringing about the permanent end to public water fluoridation ("fluoridation") in New Zealand,*" (quote from FANNZ rules).

Simple consideration of the NZFIS web site shows that it does no active work on the fluoridation issue. It's material is old, biased and there is no current activity. However, the organisation is used for distributing biased press releases and attempting to claim scientific credibility. (See, for example, my recent article [*False balance and straw clutching on fluoridation.*](#))

I can understand why Paul throws his support behind FANNZ and the NZFIS. They are part of the international tentacles of his organisation FAN. This is not about science or "weight of evidence analysis" at all. It's about political activism.

So of course Paul must bad-mouth the organisation which is doing the work and taking a scientific approach in NZ – the National Fluoridation Information Service (NFIS). He says:

"My concern here is the use of taxpayer money (about 1 million dollars) to support the promotion of fluoridation rather than presenting a balanced view of the evidence."

Well he would say that wouldn't he? He treats public funding of NZFIS as a smear! That is the typical naive conspiracy theory approach taken by climate change deniers and any other anti-science organisation who attempt to discredit scientific findings. It distorts the facts completely – governments don't employ scientists to produce a predetermined conclusion – if they wanted that theologians would be more appropriate and a lot cheaper. Research funding is not used to confirm a bias but to employ the people and resources who can answer important questions.

He also seems to think dropping a figure like "about 1 million dollars" acts as a smear. Let's put this into context – here is the NFIS budget for 2012/2013. From the 2012-2013 [annual plan](#).

11. Budget

2012-2013 Budget	\$
Permanent staff	233,305
Consortium partners	104,500
Non-consortium contract costs	10,000
Direct costs	15,695
Evaluation	20,000
Total contract costs	383,500

And, no, the NFIS does not spend its time issuing misleading press releases or providing institutional status to political activists. Here is how an early [evaluation document](#) described its role:

“NFIS is an information and advisory service which will support District Health Boards and Territorial Local Authorities by providing robust and independent scientific and technical information, advice and critical commentary around water fluoridation.”

Go to the NFIS website and have a look at its output – it is professional and balanced. It is a laugh to even compare the barely operating astroturf NZFIS with it. Of course Paul wants to discredit the NFIS – he would like our scientists and health professional to rely on his own biased political organisations instead.

My criticism of FAN

Paul says that in [making criticisms of FAN](#) I am playing a “*pro-fluoridation activist rather than a scientist.*” I disagree because scientists must be concerned about the quality of material they consider. They must be aware of ideologically driven cherry-picking, opportunist use of selected research and the promulgation of unwarranted conclusions being promoted for political or ideological reasons. This is all part of looking at all the evidence critically and intelligently.

Scientists are concerned about poor quality and misinterpretation. It is disingenuous of Paul to make an accusation of activism to ignore or deny, the legitimacy of these concerns.

Paul claims that even if “*FAN is a terrible organisation . . . That does not affect the scientific case for and against fluoridation.*” I agree – the scientific case rests on objective reality and the science itself – not on reputation or rumour. But the **determination and presentation of a case** is very much influenced by the bias and the ideological and political positions of an organisation making the case.

In my last article I analysed the way that FAN worked to demonstrate why their information and claims are unreliable. I believe that was perfectly justified from a scientific perspective.

Similarly I think my arguments above analysing Paul's mechanical interpretation of "weight of evidence," and what he means by it in practice, are also justified from a scientific perspective.

Surely such analyses must be part of the critical and intelligent consideration of the arguments of organisations and people? Isn't this what Carl Sagan meant with:

"Skeptical scrutiny is the means, in both science and religion, by which deep thoughts can be winnowed from deep nonsense."

Concluding message

Several times I have stressed my motivations in this debate are scientific and not supporting a specific policy. I am concerned at the way the scientific literature and findings are being misrepresented by ideologically driven activists. We have seen this before on issues like evolutionary science and climate change. Similar misrepresentation is currently rife among advocates of alternative and natural medicine and health. I believe it must be opposed.

Hopefully many readers have taken my point on this. While I currently believe fluoridation of drinking water is a worthwhile social policy in New Zealand I don't see it as the end of the world if it is rejected by a community. Nor do I see it as the only way of overcoming deficient levels of fluoride in our diet. And, of course, there is always the possibility that future research may change the current scientific consensus that fluoride at the levels used in water or salt fluoridation is safe and beneficial. Science is like that. Because our knowledge is always provisional, but improving over time, we sometimes do modify our conclusions.

So, if readers take my point about the need to overcome misrepresentation of science in these sorts of issues I will consider participation in this exchange worthwhile – even if most readers do not change their political views on support or opposition to fluoridation of water.

Thanks to Paul Connett for agreeing to this exchange (it was actually his idea to try it as an on-line exercise) and to all the people who participated in the comments discussion.

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