

A response to Dr. De Villa's review of the literature on fluoridation's safety and effectiveness

By Paul Connett, PhD,

Co-author of *The Case Against Fluoride* (Chelsea Green, 2010)

### **Introductory comment.**

Before I detail my critique of De Villa's assessment of the safety and effectiveness of the fluoridation program I would like to make this observation based on my 21 years of following the fluoridation debate and the science of fluoride's toxicity.

The simplest explanation for the sordid (from a scientific point of view) way that health agencies in Australia, Canada, Ireland, New Zealand, and the US have gone about selecting expert panels; writing reviews of the literature and making public statements on fluoridation is that they are more interested in protecting this program than they are in protecting the health of their citizens. This is very sad and ultimately very dangerous because it will further erode the trust of the people in their governments, especially the agencies set up to protect their health. We have already seen in the election of Donald Trump in the USA what an impact the losing of the public's trust in government can have on the political process. We do not want to see this erosion extend into the regulatory process.

I was present in the Peel region on Jan 21, 2016, when Dr. de Villa told the councilors that her department had reviewed the literature on fluoridation and had concluded based upon their "scientific review" that there were absolutely no concerns about fluoridation's impact on health including fluoride's impact on the brain. As I have been following this specific issue for 21 years I was astounded to here this statement and have been eagerly waiting to read the analysis that formed the basis for this assessment. I now have that in hand and here is my response.

### **My overall response.**

The de Villa assessment is superficial; highly selective; inaccurate and biased. This is true on several issues, including:

- a) Fluoride and neurotoxicity, specifically its potential to lower IQ in children.
- b) The review of fluoride's possible link to osteosarcoma (Bassin et al, 2006)
- c) The Cochrane review of effectiveness (Iheozor-Ejiofore et al. (2015)

I will now address several concerns:

- 1) **De Villa's Clear evidence of bias**
- 2) **The "self-serving" ways the selection criteria** for which studies were selected for review.
- 3) **What a genuine risk assessment would look like with a specific example provided for determining a safe level of exposure to protect children from a lowering of IQ**
- 4) **The inaccurate and cavalier rationale** for downplaying the very significant absence of **randomized control trials (RCT)** for either effectiveness or safety.

1) **De Villa's Clear evidence of bias.** In her quality ratings of the articles reviewed, de Villa gives a rating of "strong" to studies that find in favor of fluoridation (Broadbent, 2015 – a very poor study, see the commentary from Michael Connett below) and a poor quality rating to many studies that find health concerns (e.g. Bassin, 2006; Landrigan and Grandjean; Malin and Till, 2015; National Research Council, 2006 (endocrine function); Peckham, 2015). In my view, these ratings do not reflect an objective assessment of the scientific merits of these studies, but rather the bias of someone defending the fluoridation program. Specifically, here is an alternative assessment of the Broadbent study for which de Villa gives a "strong" rating.

**THE BROADBENT STUDY DOES NOT ESTABLISH THE SAFETY OF FLUORIDATION**

Some commentators have incorrectly claimed that the recent study by Broadbent et al. establishes the safety of water fluoridation for neurologic development. The Broadbent study found no difference in the IQs of children and adults who spent their first 3 to 5 years of life in fluoridated (0.7 to 1.0 mg/L) vs. non-fluoridated (0 to 0.3 mg/L) areas of Dunedin, New Zealand. A glaring limitation with the Broadbent study, however, is that a substantial portion of the “non-fluoridated” control population used 0.5 mg/day fluoride tablets and fluoridated toothpaste, resulting in only a marginal difference in average total fluoride exposure between the fluoridated and non-fluoridated populations.<sup>47</sup>

In fact, in response to criticism on this point, (Osmunson et al. 2016), the authors conceded that the average difference in total daily intake between the children in the fluoridated and non-fluoridated areas would be < 0.3 milligrams per day, while the average intake for all subjects was 0.9 mg/day.<sup>48</sup> (Broadbent et al. 2016). At most, therefore, the Broadbent study established that < 0.3 milligrams of fluoride was not a sufficiently large enough contrast in daily fluoride exposure to produce a demonstrable effect on *average IQ* in the study cohort. This does *not* mean, however, that the fluoride exposures in a fluoridated community are safe, since no truly low exposure comparison group existed in the Broadbent study, and the Broadbent team made no attempt to study vulnerable subsets of the population (e.g., those with suboptimal nutrition, genetic polymorphisms, etc).

The inherent limitation resulting from the Broadbent study’s comparison of populations with marginal contrasts in fluoride intake highlights an important strength of the endemic fluorosis/IQ studies from China, India, Iran, and Mexico. Specifically, the endemic fluorosis studies have generally compared communities with clear and stable contrasts in fluoride exposure, thus increasing the power of these studies to detect fluoride’s effect on IQ. Moreover, unlike Broadbent’s study, many of the endemic fluorosis studies have analyzed the relationship between IQ and individual measures of exposure (e.g., individual urine fluoride levels), thus overcoming the limitation imposed by Broadbent's ecological (group level) estimates of fluoride intake. Although Broadbent and others have criticized the endemic fluorosis studies for failing to control for potential

confounders, several of these studies did carefully control for confounders and the association between fluoride and cognitive impairment remained intact. (Choi et al. 2015; Rocha Amador et al. 2009; Xiang et al. 2003a,b; Xiang et al. 2013). Further, while it's undisputed that many of the IQ studies used relatively simple study designs, the consistency of these studies, and their repeated corroboration by research showing that fluoride impairs learning in rodents under carefully controlled laboratory conditions, gives confidence to the conclusion that fluoride is a neurotoxin that impairs cognition. (Michael Connett, 2016)

**2) The “self-serving” ways the selection criteria** for which studies were selected for review.

De Villa explains her criteria as follows in section **3) the Scope of Review:**

**a) Nature of Evidence**

The current evidence review investigates the relationship between CWF with fluoride concentrations within the range of 0.5-1.2 mg/L and any potential health effects. As a result of assessing health effects at this range, toxicological studies are not within scope of this nature of evidence review. Generally, most toxicological studies in animal models involve examining impacts at exposures much higher than the community exposure associated with fluoridation of drinking water.

In my view, this limited selection criteria is self-serving and deceptive on two grounds. Firstly, de Villa knows full well that in countries that fluoridate (and especially Canada) very few studies of health effects in communities drinking artificially fluoridated water have been conducted. To conclude that the absence of study is the same as the absence of harm is self-serving and unprotective of the public interest.

Also her focus on *concentration* as the metric of exposure as opposed to *dose*, indicates a distinct lack of knowledge and understanding as to how toxicology and genuine risk assessment are practiced.

**3) For a genuine risk assessment it is necessary:**

- A) to use ALL studies available (both animal and human) to ascertain a dose and dosage (in mg/day and mg/kilogram bodyweight/ day) at which harm has been found, then
- B) apply adequate safety factors to ascertain a safe daily reference dose protective of everyone in a large population and then
- C) examine the full range of the total dose to all sources of fluoride being experienced in Ontario- only then
- D) can one ascertain if it is safe for everyone in Ontario to be drinking uncontrolled amounts of fluoridated water.

#### **4) Protecting children against a lowering of IQ from fluoride exposure.**

There are over 300 scientific studies that need to be reviewed to do a thorough and comprehensive review to ascertain whether or not water fluoridation poses a neurotoxic threat to people in Ontario and whether it poses a specific threat to the IQ of Ontario's children, especially the most vulnerable.

De Villa only superficially reviewed Broadbent, 2015; Choi et al, 2012 (a meta-analysis of 27 IQ studies); Grandjean and Landrigan, 2012; Malin and Till, 2015; the National Research Council, 2006 and Peckham, 2015.

Fortunately, such a comprehensive review has recently been conducted as part of a petition to the US EPA to ban the deliberate addition of fluoridation chemicals to the public water supply under section 21 of the Toxic Substances Control Act ("TSCA"). This petition and over 300 supporting documents ("exhibits") will be publicly available in the week beginning Nov 28, 2016. Meanwhile, here is a key conclusion:

**"...children exposed to 1.4 mg fluoride per day will have, on average, 5 less IQ points than children exposed to no fluoride. The RfD (safe reference dose, PC) would obviously need to be set at a lower level, since such a large loss in IQ is clearly an adverse effect, and because uncertainty factors would need to be added to account for variation in sensitivity within a population as large as the U.S. "**

In my view, the minimal safety factor that could be defended (to protect against the full range of sensitivity in a large population) would be no less than 10 resulting in a **safe reference dose of 0.14 mg/day.**

**To put this in perspective a child drinking one liter of fluoridated**

**water at 0.7 ppm, would get a daily dose of 0.7 mg/day – which would be 5 times the safe reference dose for potential loss of IQ.**

**4) The inaccurate and cavalier rationale for downplaying the very significant absence of randomized control trials (RCT) for either effectiveness or safety.**

An RCT is the gold standard for epidemiological evidence in establishing the safety and effectiveness of a new drug. One of the reasons that FDA has stated that fluoride is an “unapproved drug.”

De Villa’s rationale:

### **c) Randomized Controlled Trials**

Members of Council have also questioned the lack of randomized control trials on CWF. Research experts have confirmed that the nature of the research question makes randomized control trials unfeasible. Such trials would require a group of people who have never been exposed to CWF in the past to ensure past exposure did not introduce bias. There are ethical concerns regarding allocation of individuals to the non-fluoridated group given documented evidence of effectiveness. Furthermore, to ensure a quality randomized control trial, 100 per cent of the water consumed would need to be provided by the research team and the required length of observation would be a significant obstacle in the feasibility and cost of conducting such a study.

An interpolated response to this statement:

“Research experts have confirmed that the nature of the research question makes randomized control trials unfeasible.”

Who are these "research experts"? There is nothing unfeasible about conducting a Randomized Controlled Trial (RCT) on the question of whether fluoridated water is effective at reducing decay, and if so, the degree to which it reduces decay.

“Such trials would require a group of people who have never been exposed to CWF in the past to ensure past exposure did not introduce bias.”

This is incorrect, since it is widely accepted by the CDC and by dental researchers that the main effect of fluoridated water is topical and does not arise from incorporation of fluoride into tooth enamel during early years when the teeth are developing. Therefore, previous exposure to fluoridated water would not invalidate an RCT. This statement also illustrates a

fundamental lack of understanding of RCTs. RCTs are the gold-standard for scientific evidence because they randomly assign people to either get the treatment or placebo. This randomized assignment means that no biases can arise from extraneous factors, including previous exposure to fluoridated water. Roughly as many people with such exposure would be assigned to the treatment group as the control placebo group so any effect that prior exposure might have would be balanced out.

Furthermore, it would not be difficult to conduct the study in which few, if any, people had ever had exposure to fluoridated water. 98% of Europe has no fluoridated water, and almost no countries in Africa or Asia have fluoridated water, other than in a few specific areas with high natural fluoride.

**“There are ethical concerns regarding allocation of individuals to the non-fluoridated group given documented evidence of effectiveness.”**

The US FDA requires RCTs as the only adequate quality of evidence when approving new medical drugs and other medical treatments. So, by definition, a medical drug or treatment that has not been proven with RCTs does not have adequate evidence of effectiveness. Otherwise, there would be no need to require RCTs. Since fluoridated water has never undergone an RCT, it does not have adequate evidence of effectiveness and it would be ethically allowable to conduct one.

Furthermore, there are many countries in the world which do not accept claims of fluoridation effectiveness. In those countries, there would be no ethical constraint on conducting an RCT.

**“Furthermore, to ensure a quality randomized control trial, 100 per cent of the water consumed would need to be provided by the research team and the required length of observation would be a significant obstacle in the feasibility and cost of conducting such a study.”**

This is ridiculous. In the real world of fluoridated water, few people consume all their water from a single source. They drink bottled water, they drink tap water, they drink bottled beverages, some of which are fluoridated and others of which are not. They travel and consume water of various concentrations of fluoride. A quality RCT would not have to require that all water be provided by the researchers. In fact, such a study design would be less reflective of real life conditions than one in which a certain amount of researcher provided water was consumed.

Many RCTs conducted by drug companies require long lengths of time. That is no obstacle