

The science that justifies concerns about fluoridating water

I was surprised and very disappointed in Professor Ian Shaw's Op-Ed piece in the Dominion Post (16/2/15) entitled, *The Fuss About Fluoride*.

Professor Shaw is director of biochemistry and Professor of toxicology at the University of Canterbury and I am sure he knows a lot about toxicology. However, I have to say, as a Professor of Chemistry, who specialized in environmental chemistry and toxicology, and studied fluoride's toxicity and the fluoridation debate for 19 years, Professor Shaw's knowledge of fluoride's toxicology is somewhat superficial and in some cases extremely inaccurate. For example his claim of a safe dose of 2 grams is out by at least three orders of magnitude (see below).

So let me explain what the scientific basis is for the "fuss" about putting fluoride in the public water supply. Since Professor Shaw makes a big thing about doses and concentrations, let's look at "nature's" take on what a safe level of fluoride is for babies. It is remarkably low – only 0.004 ppm (parts per million) (National Research Council review, 2006, p.40). This means that a bottle-fed baby (for which the formula is made up with tap water at 1 ppm fluoride) is getting 250 times more fluoride than a breast-fed baby. In my view that is a reckless thing to do.

Since 1995 this recklessness has become particularly apparent. Since then there have been numerous studies that have shown that fluoride is neurotoxic at fairly modest exposure levels (for a full listing and description of many of these studies and those cited in this article see www.FluorideALERT.org/issues/health/brain .)

There have been over 100 animal studies that indicate that fluoride can enter the brain, concentrate in certain parts, interact with key enzymes and receptors and possibly with calcium messaging systems. Not all these studies – as many animal studies are – were conducted at high doses. For example Varner et al in 1998 showed that rats given fluoride in their drinking water at 1 ppm for one year, developed kidney damage, brain damage, and experienced a greater uptake of aluminium into the brain and the formation of beta-amyloid deposits, which in humans may be an indicator of Alzheimer's disease. There have also been 30 studies (out of 32) that show that fluoride exposure interferes with the ability of rats to learn and remember.

These animal findings are consistent with the 43 out of 49 studies that have found an association between modest exposure to fluoride and lowered IQ in children. Twenty-seven of these studies were reviewed by a team from Harvard University and they found that in 26 of them the mean IQ in the "high fluoride" village was lower than the "low fluoride" village. The average lowering was 7 IQ points (Choi et al., 2012). In at least five of these studies the concentration in the high fluoride village was less than 3 ppm.

In one particularly well-designed study Xiang et al (2003a,b) found that some children had their IQ lowered at 1.5 ppm. Professor Shaw should know that this finding offers no margin of safety to protect all the children in NZ or any other fluoridated country. Especially, when one finds that the children in this study in rural China were probably not bottle-fed nor did they use fluoridated toothpaste. So some children in NZ drinking fluoridated water and using fluoridated toothpaste

would exceed the doses experienced by some of the children in the study. In addition, there is no margin of safety to protect for the full range of sensitivity to any toxic substance expected in a large population. Again as Professor Shaw doubtless knows, the default value used by regulatory toxicologists to allow for intra-species variation is a safety factor of ten!

So to protect against loss of IQ based on this (and other studies) a safe dose would be less than 1 mg per day – some 2000 times less than the safe level of 2 grams claimed by Professor Shaw for “bona fide toxicity.”

Promoters of fluoridation frequently exaggerate the benefits of fluoridation by translating the small difference in tooth decay saved into a percentage rather than giving the absolute number of teeth or tooth surfaces actually saved. A classic case of this occurred in Queensland in 2007 when civil servants in Queensland Health said in advertisements run in the press that the difference in tooth decay in fluoridated Townsville was 65% less than in unfluoridated Brisbane. But when you check the single study on which this was based it was for only one age (7 year olds) and the absolute saving was 0.12 of one tooth surface out of about 100 tooth surfaces in a child’s mouth. So I am afraid Professor Shaw’s claim of a saving of 60% in tooth decay could well turn out to be far less impressive when it is converted into actual tooth surfaces saved and far from the “massive” benefit he claims. Even if the benefit was much larger, if it comes at the expense of lowering some children’s intelligence how could it be justified? The last children that need a lowered IQ are children from low-income families, precisely the ones targeted by this practice.

Fluoridation does not make sense especially now it has been acknowledged by promoters that the predominant benefit of fluoride is topical not systemic (CDC, 1999). In other words fluoride works largely on the outside of the tooth (by the mechanisms discussed by Professor Shaw) not from inside the body. As such it is far more rational for those who want fluoride to brush it on their teeth and spit it out, than to put it in everyone’s water supply with all the risks entailed. It would also be more ethical, since using this approach would not force fluoride on people who don’t want it.

I will be in New Zealand shortly (Feb 22-27) and would be more than happy to engage Professor Shaw further on this matter, and if he so chooses in an open public debate.

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