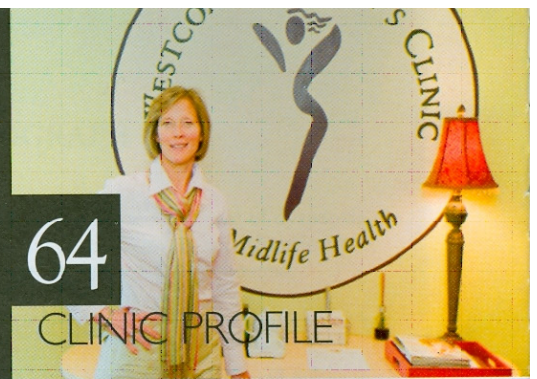


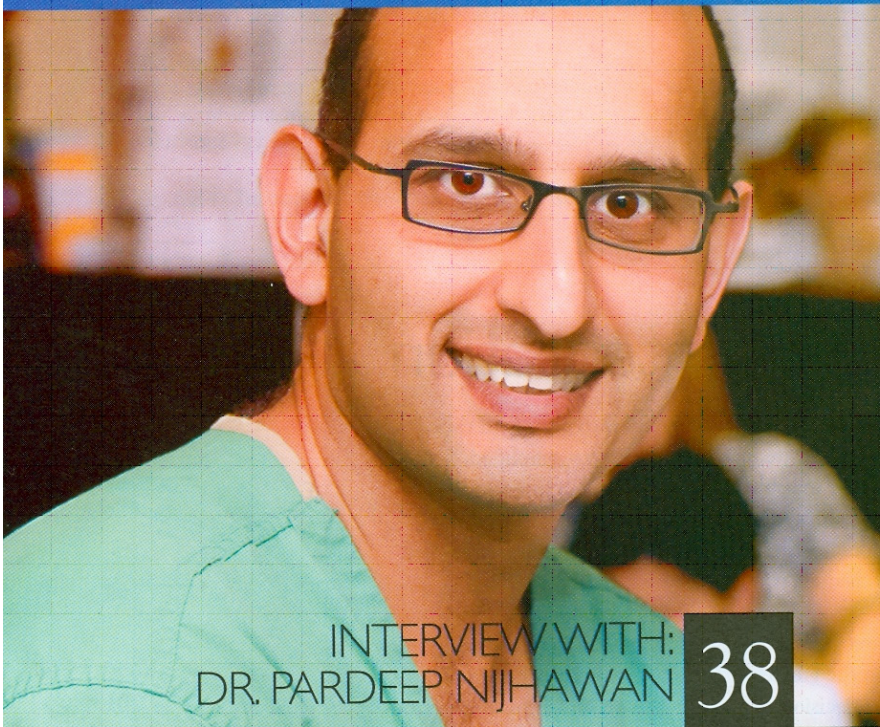
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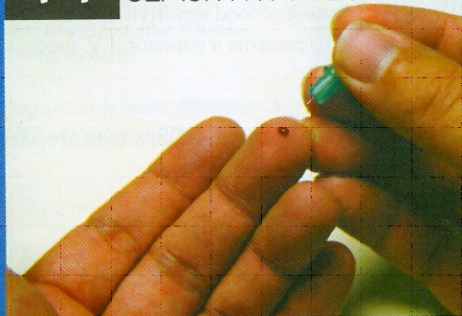


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QUALITY CONTROL:  
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# Motherhood, Apple Pie and Fluoridation

## A critical evaluation of fluoridation practices in Canada

By Brian D. McLean, B.Sc., D.D.S

Because of our training, water fluoridation is seen as somewhat sacred to dental professionals in North America. Motherhood, apple pie and fluoridation all snuggle together into the same mental compartment in our minds.

What else in dentistry do we revere? History taking? Diagnosis preceding treatment planning? Evidence-based decision making? Risk assessment? Informed consent?

My mind wanders in this direction because of two recent events. The first was just a few years ago when I attended a lecture by Hardy Limeback, Ph.D., D.D.S, Head of the Department of Preventive Dentistry, at the University of Toronto. The second "event" was reading a piece on pages 16 and 17 of the April-May, 2003 issue of the Dispatch. This is the quarterly magazine sent to all dentists in Ontario by our governing body, The Royal College of Dental Surgeons of Ontario (RCDSO.)

Dr. Limeback, since 1999, has been actively campaigning against fluoridation of our water supplies. The RCDSO article defended water fluoridation with the following points:

1. We've been doing it since 1945.
2. There has been a significant decrease in dental decay in fluoridated areas.
3. The ODA, the CDA, Health Canada, The ADA, CDC etc. endorse it.
4. Those who oppose it offer "no credible evidence."

Confused, I e-mailed Dr. David Banting, who is responsible for public health matters at the University of Western Ontario in London, Ontario's only other dental school.

I asked: "I know that Dr. Hardy Limeback at U of T is currently not in favour of fluoridation of public water supplies. I am wondering whether Western is still maintaining the 'traditional' view; and why or why not."

Dr. Banting replied (in part), "Community water fluoridation remains the most cost-effective and equitable means of delivering an anti-caries preventive agent that has been shown, unequivocally, to be highly effective."

"There are various ways in which daily fluoride intake can be adjusted, and that, in my opinion, is where the controversy lies. Not fluoridating the community water is one way to reduce daily

fluoride intake. ...Community water fluoridation, on the other hand, is delivered to all very efficiently and consistently, is provided at no direct cost and does not require compliance. The critical issue is the total daily intake of fluoride. The scientific evidence strongly supports a 1mg/day intake as being associated with maximum anti-caries effect and minimal risk of fluorosis. An even lower daily dose is appropriate for younger children."

"What has happened, of course, is that the average daily fluoride intake has increased (perhaps doubled in some cases) over the past four or five decades since the introduction of community water fluoridation because of the almost ubiquitous use of fluoridated toothpaste, the often inappropriate use of fluoride supplements and excessive consumption of carbonated beverages. In young children, this vastly increases the risk of dental fluorosis. I'll leave it to you to decide what is the best way to limit daily fluoride intake."

Well, that was strange. On the one hand, it is "unequivocally highly effective" but on the other, we are overdosing everyone. "The important thing is to not stop questioning. Curiosity has its own reason for existing." - Albert Einstein

### Is There Really a Case Against Fluoridation?

Let's look at what we do believe about fluoridation and why. The RCDSO tells Ontarians that:

1. We've been doing it since 1945. That does not speak to the merits of the issue. It is just history.
2. There has been a significant decrease in dental decay in fluoridated areas. Somehow they forgot to mention the similar decreases in those areas that have never been fluoridated (Colquhoun 1996) or the locales that have discontinued fluoridation (Maupome 2001).
3. The ODA, the CDA, Health Canada, The ADA, CDC etc. endorse it. This is likely to be compelling at first blush, though evidence is what really counts. While supporters or dissenters with interesting credentials may call one's attention to an issue, what matters is not who supports the data, but what the data supports.
4. Those who oppose it offer "no credible evidence." The Centres for Disease Control and Prevention (CDC) use that phrase, too: "The safety and effectiveness of water fluoridation have been re-evaluated frequently, and no credible evidence supports an association between fluoridation and any of these conditions (CDC 1999)." They, in turn, cite the Subcommittee on Toxicology of the National Academies Press (1993).

Recommendations for further research are proposed: "Determine the metabolic characteristics of fluoride in infants, young children and the elderly. Determine prospectively the metabolic characteristics of fluoride in patients with progressive renal disease."

This may not represent evidence against the practice of water fluoridation. However, is it not a frank and credible admission of ignorance concerning the safety of its systemic effects? Is this congruent with the blithe assurances of the CDC and RCDSO that all arguments against water fluoridation are "not credible?"

Two large studies, one by the National Institute of Dental Research in the U.S. (CDC 1999) and another in Australia (Spencer 1996) found only a trivial benefit from lifelong exposure to fluoridated water. The better result was from the American study where fluoridated children enjoyed a whopping 0.6 fewer decayed, missing and filled tooth surfaces (DMFS) than children (aged 5 to 17) who had lived their whole life without the "benefit" of fluoridation. In Australia the benefits were half of those demonstrated in the U.S.

These modest results are cited as evidence to promote fluoridation. How? Because the actual 17-year accumulated decay (3.4 DMFS vs 2.8 DMFS) is so low that even the tiny benefit demonstrated looks worthwhile  $0.6/2.8 \times 100 = 21\%$ . This 21% reduction achieves statistical significance.

Here is an appropriate analogy: an individual weighs 300 pounds and studies show that while on Diet A, he will lose two pounds, while Diet B will help him lose four pounds. That means Diet B is 100% more effective than A. However, if all goes well, the individual will still weigh 296 pounds.

Furthermore, very credible evidence brings even this modest benefit into doubt. According to Dr. Limeback, we are guilty of a very significant oversight; one systemic effect of fluoride is that it interferes with tooth development in such a way that eruption is delayed typically by approximately six months to a year. The apparent 21% reduction in caries risk may be due to the simple fact that the teeth have been exposed to a cariogenic oral environment for a shorter time (Kunzel 1976). So with a next-to-zero benefit, the risk/benefit ratio requires reevaluation.

#### Does Excessive Fluoride Intake Pose Health Risks?

Returning to our weight-loss analogy, suppose it turns out that Diet B was Fen-Phen, and the individual's heart valves suffer damage to achieve that extra two-pound loss. Would that person still choose Diet B over Diet A? [For purposes of this discussion, we will ignore the irony that Fen-Phen was a fluoride-based drug.]

Dr. Banting mentions fluorosis as the risk of relevance – the white/brown discoloration of teeth we all see so often. This "cosmetic problem" is what we tell ourselves is the limit of the downside to water fluoridation.

However, fluorosis, it seems, is likely the direct effect of the fluoride ion interfering with the enzymes responsible for the removal of protein between prisms of developing enamel (Second Look 2003). A minor failure to remove the organic matrix alters the optical properties of enamel – indeed, a cosmetic problem. A major failure to remove this matrix results in severe fluorosis – a dental disaster. This outcome is conveniently ignored in discussions of fluoridation concerns.

Why do dentists keep forgetting that teeth are part (a small part) of the whole body? Back in 1946, Dr. James Sumner won the Nobel Prize in Chemistry for his work with enzyme crystallization. On the issue of water fluoridation (a recent addition to public policy at the time), he warned:

"We need to go slowly. Everybody knows fluorine and fluorides are very poisonous substances...we use them in enzyme chemistry to poison enzymes, those vital agents in the body. That is the reason things are poisoned; because the enzymes are poisoned and that is why animals and plants die"

He was not predicting that we would all drop dead upon the introduction of fluoridation. Surely, he was warning against the cumulative effects of low-dose toxicity – 50% of the fluoride we ingest remains in our bones for many years.

There are many references in medical literature linking excessive fluoride intake to skeletal fluorosis. Severe disabling and deforming skeletal fluorosis is common in some parts of the world and attributed to very high exposure to fluoride. Still, less severe forms are seen with fluoride ingestion of 1-4mg per day – a total dose easily achieved in our fluoridated communities. In its early stages, skeletal fluorosis is indistinguishable from arthritis (Danielson 1992).

Similarly, there exists a strong evidence base linking fluoridated drinking water to increased hip fractures (Danielson 1992). Hip fractures have been closely correlated to increased mortality in the elderly (Hannan 2001).

While the basis for caution with regards to fluoridation may reside in epidemiological data, this is not exactly an area where direct causal relationships from RCT trials is a possibility. How would such an RCT trial be designed? Who would pay for it? In the meantime, we ignore the warning signs that continue to surface as the years go by. We continue to use the population as an ongoing human experiment without the slightest interest in what may be systemic effects of this agent on human health, save our acceptance of the "cosmetic" problem of dental fluorosis.

Dr Banting said, "An even lower daily dose is appropriate for younger children." That should not be a problem. One would assume that little bodies would automatically consume less water, however, Ershow and Cantor state in their 1989 study.

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"When considering water ingestion in units of millilitres per kilogram of body weight per day, this analysis shows that the mean per capita ingestion rates (of fluoride) for babies younger than one year are estimated to be three to four times higher than the mean rates for the population as a whole."

Infant formula reconstituted with tap water can contain 100 times more fluoride than breast milk (Diesendorf 1997). If you were a mother choosing between breast-feeding and bottle-feeding your baby, would you want to know that your baby would be receiving 100 times the fluoride dose relative to breastfeeding the baby? You are drinking the fluoridated water, but apparently your body has the wisdom to withhold the molecule from your infant. Perhaps you should redesign your physiology to make it more congruent with prevailing fluoridation dogma. In 2000, Dr. Arvid Carlsson was one of the Nobel Laureates in Medicine. He had this to say.

"Water fluoridation also goes against leading principles of pharmacotherapy, which is progressing from a stereotyped medication – of the type 1 tablet three times a day – to a much more individualized therapy as regards both dosage and selection of drugs. The addition of drugs to the drinking water means exactly the opposite of an individualized therapy. Not only in that the dose cannot be adapted to individual requirements. It is, in addition, based on a completely irrelevant factor, namely consumption of drinking water, which varies greatly between individuals and is, moreover, very poorly surveyed."

By endorsing fluoridation, are we not, in effect, "prescribing" it to everyone, without taking a medical history, ignoring the principles of informed consent, and insisting that the prescription gets filled and taken more (not less, it seems) than directed? Dental fluorosis is caused by systemic fluoride during tooth development. The CDC states:

"Fluoride's caries-preventive properties initially were attributed to changes in enamel during tooth development because of the

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association between fluoride and cosmetic changes in enamel and a belief that fluoride incorporated into enamel during tooth development would result in a more acid-resistant mineral. However, laboratory and epidemiologic research suggests that fluoride prevents dental caries predominately after eruption of the tooth into the mouth, and its actions primarily are topical for both adults and children (CDC 1999) "

Decay is prevented topically. Fluorosis is caused systemically. Perhaps once upon a time we did not know any better; but upon what basis do we continue to force people to swallow fluoride when clearly topical application achieves the desired benefit?

The justification for fluoridation used to be that systemic administration was required for uptake into the developing teeth of children. Not surprisingly, the Canadian Paediatric Society has a position paper on the issue. It now states (Canadian Paediatric Society 2002):

- The primary mechanism of the action of fluoride in preventing tooth decay is topical.
- Water fluoridation is an effective delivery method for topical fluoride.
- Water fluoridation is an effective mechanism by which fluoride prevents tooth decay.

However, if that is the case, then what is the justification for putting fluoride in our toothpaste at all, let alone at a thousand times the concentration of our water supply?

It is also mandatory, in order to accept this logic, that all systemic effects of fluoridation be limited to dental fluorosis, and that this be a minor "cosmetic" problem only. It would seem that the case for fluoridation can only be maintained by forsaking what values we hold in science and the scientific method, pharmacotherapeutics, history taking, risk assessment, informed consent and common sense. I truly believe you have to choose either the latter package of values or water fluoridation. They are mutually exclusive. ■

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