

**Alberta Health**

# **Position statement on community water fluoridation**

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*Alberta*  Government

Alberta Health and Alberta Health Services recognize that community water fluoridation effectively prevents tooth decay, especially among people who are most vulnerable. It offers significant benefit with very low risk and reaches all residents who are connected to a municipal water supply. Therefore, Alberta Health and Alberta Health Services endorse community water fluoridation as a foundational public health measure to prevent dental disease and improve oral health.

## Background

Despite significant improvements in oral health over the last several decades, dental caries (tooth decay) continue to be a common health problem among Canadians, with consequences including pain, infection, impaired chewing ability, compromised appearance, tooth loss, and absence from work or school. Dental caries occur when bacteria present in the mouth turn sugar and carbohydrates in the foods we eat into acids. These acids attack the tooth enamel and create decay.

Fluoride is known to have a protective effect against dental caries throughout life. In infants and children with pre-erupted teeth, ingested fluoride is incorporated into the structure of developing tooth enamel, making it more resistant to decay after eruption. In adults, drinking fluoridated water reduces the rate of demineralization and promotes the remineralisation of early caries. A constant low level of fluoride, such as that found in fluoridated drinking water, is able to provide a more constant supply of fluoride to teeth throughout the day than brushing with fluoridated toothpaste alone.

More than 56 per cent of 6–11 year-old children and almost 96 per cent of adults have experienced tooth decay (1). Dental caries are more prevalent among disadvantaged people who do not have the financial resources to receive dental care. Poor oral health affects the wellbeing and quality of life of millions of Albertans while costing money and time off from school and work. Teeth affected by dental caries may require repeated treatments and repair over the years. Reducing tooth decay benefits everyone by minimizing the need for fillings, tooth replacements and emergency care.

Dental care cost Canadians approximately \$12.5 billion in 2013 of which over ninety percent was funded through private insurance and out of pocket expenses (2). As a costly population level problem that affects the wellbeing of Albertans, oral disease is a public health concern that needs to be addressed. Preventing the disease is the best option.

Community water fluoridation (CWF) is the deliberate adjustment of the fluoride concentration in drinking water to optimal levels to ensure safety and achieve desired health benefits. CWF began in Canada in 1945 and early results showed a 39 per cent reduction in decay among primary teeth and a 53 per cent reduction in decay for permanent teeth; all at a cost less than 20 cents per person per year (3). Further, dental care costs decreased significantly for children born in fluoridated communities after fluoridation began (4).

The fluoride-containing compounds that are used for CWF have been shown to dissolve fully in water and release fluoride ions. These are the same fluoride ions that can be found naturally in water. Some drinking water has very low levels of fluoride and therefore requires the addition of fluoride to obtain health benefits. Health Canada recommends the addition of fluoride to an optimal level of 0.7 ppm for fluoridation programs. Municipal water treatment operators in Alberta are required to regularly monitor their water supply to ensure that fluoride levels do not exceed the

Maximum Allowable Concentration of 1.5 ppm recommended by Health Canada in the *Guidelines for Canadian Drinking Water Quality*.

There has been a multitude of scientific studies evaluating the effectiveness and safety of CWF published over the last six decades, including several high-quality systematic reviews of the literature. Systematic review methods are designed to be comprehensive, transparent, reproducible, and to minimize selection bias. They provide the highest level of scientific evidence by assessing all available information on a topic. Despite its long history and wealth of data showing improvements in oral health with CWF, this public health measure remains controversial. It is important to consider all of the research evidence on the issue as non-systematic selection of single reports may lead to inconclusive results and unsupported decisions.

Across Canada, municipalities have the responsibility for deciding on water fluoridation in their community and many communities do not fluoridate their water. Therefore, even though fluoridation has been proven to be a safe and effective practice, many Albertans do not have fluoridated water. Municipalities may look to senior levels of government and health authorities for guidance on the decision to fluoridate drinking water. This document provides a clear statement of support for community water fluoridation and outlines the current rationale for supporting it in Alberta. As research accumulates on this topic, Alberta Health will continue to review the evidence on CWF and adapt provincial recommendations accordingly.

## Effectiveness of community water fluoridation

Studies show that fluoridation continues to be effective in reducing tooth decay even in an era with widespread availability of fluoride from other sources, such as fluoridated toothpaste. There have been several major systematic reviews of the literature published on this topic in addition to dozens of individual studies confirming the benefits of CWF.

Systematic reviews of the large body of scientific evidence have consistently concluded that CWF is effective at decreasing the prevalence and severity of dental caries. Effects include significant increases in the proportion of caries-free children and significant reductions in the number of teeth or tooth surfaces with caries in both children and adults. Additionally, between communities comparisons have demonstrated fewer cavities within communities where the drinking water is fluoridated. McLaren et al., recently reported the adverse effect on children's oral health following the cessation of CWF in Calgary (5).

A systematic review conducted in the UK in 2000 included before/after studies and prospective cohort studies looking at the impact of CWF initiation on caries prevalence and severity in children (6). The review included 26 studies and found that the best available evidence showed that fluoridation was associated with:

- approximately 15 per cent more children totally free from tooth decay; and

- an average of two fewer decayed, missing or filled teeth per child.

Truman et al., published a systematic review in 2002 of 36 studies that concluded there is “strong evidence that water fluoridation is effective in reducing the cumulative experience of dental caries within communities” (7).

A 2003 Cochrane systematic review of 74 studies of fluoride toothpaste concluded that fluoridation provided a benefit over and above that of toothpaste alone (8).

A 2007 meta-analysis of 20 studies found that fluoridation prevented 27 per cent of tooth decay in adults (9).

A 2015 Cochrane review of the literature, which included 107 studies, concluded that water fluoridation is effective in reducing caries in deciduous and permanent teeth in children (10). This review found that, in comparison to the control group, fluoridation was associated with:

- a 35 per cent reduction in decayed, missing or filled deciduous teeth
- 15 per cent more caries free children in deciduous dentition, and 14 per cent more in permanent dentition

The overall body of scientific evidence supports CWF as an effective public health strategy to reduce dental disease.

## Safety of community water fluoridation

A number of potential adverse effects of fluoride have been suggested. As fluoride is present at naturally high levels in drinking water used in some parts of the world, it is important to distinguish between fluoride effects at very high levels and effects that may occur at the levels recommended for CWF. Studies examining the effects of fluoride at the levels recommended for CWF have shown that fluoride does not pose a risk to human health.

A systematic review conducted in the UK in 2000 considered 214 studies on the safety and efficacy of water fluoridation; 88 concerned side effects other than dental fluorosis (6). The review included *all studies showing any negative effects from water fluoridation in humans*. They found no association with water fluoride and adverse effects such as cancer, bone fracture and Down’s syndrome.

Australia’s 2007 review update found insufficient evidence to reach a conclusion; a detailed review on bone fracture risk showed fluoridation has little effect, either protective or deleterious (11).

Health Canada’s Expert Panel review of fluoridation examined *all identified human health risks, taking into account new studies and approaches* including a literature review and total diet study (12). The 2010 report found that fluoride in drinking water up to twice the recommended amount is unlikely to

cause adverse health effects, including cancer, bone fracture, immunotoxicity, reproductive/developmental toxicity, genotoxicity, and/or neurotoxicity. A fluoride level of 0.7 ppm in drinking water prevents excessive intake of fluoride through multiple sources of exposure.

In 2011 the European Commission's critical review (13) of new evidence on the hazard profile, health effects, and human exposure to fluoride found:

- the weight of evidence did not substantiate adverse health effects such as carcinogenicity, developmental neurotoxicity and reproductive toxicity;
- exposure of water organisms to fluoridated water is not expected to lead to unacceptable risks to the environment; and
- the fluoridation additive, hydrofluorosilicic acid, rapidly hydrolyzes in water and acts as if fluoride is naturally present in the water. Any slight impurities in the additive are at least 100 times less than drinking water guidelines established by the World Health Organization and are not regarded as a health risk.

The overall body of scientific evidence supports CWF as a safe public health measure.

## Dental fluorosis

All sources of ingested fluoride, including fluoride in drinking water, toothpaste and dietary fluoride supplements, increase the likelihood of dental fluorosis— a discolouration of the teeth that occurs during development. Dental fluorosis ranges from barely visible lacy white markings in mild cases to pitting of the teeth in the rare, severe form. There is a dose-response relationship between fluoride intake and fluorosis. The risk for and severity of dental fluorosis depends on the amount, timing, frequency, and duration of fluoride exposure. Surveys in Australia (14) and New Zealand (15) have found no significant differences in dental fluorosis between areas with fluoridated and non-fluoridated drinking water.

The Canadian Health Measure Survey 2007–2009, identified less than 0.3 per cent of children as having dental fluorosis in Canada (16). Additionally, in Canada, the prevalence of dental fluorosis of cosmetic concern is minimal. Most people with very mild dental fluorosis are unaware; it is barely noticeable to the untrained eye and does not affect health. Therefore, the burden of this condition at the population level is very small.

## Cost-effectiveness

There have been multiple studies evaluating the cost-effectiveness of CWF including studies from the US, Australia and Canada. All of these studies have indicated that CWF is cost-effective. In a 2015 systematic review of the economics of CWF, it was concluded that the economic benefit of CWF exceeds the intervention cost. Furthermore, the cost-benefit ratio improves as the community population size increases (17). For larger communities of more than 20,000 people, it is estimated

that every \$1 invested in this preventive measure yields approximately \$38 savings in dental treatment costs (18).

Although other fluoride-containing products are available and contribute to the prevention and control of dental caries, CWF has been identified as the most cost-effective method of delivering fluoride to all members of a community, regardless of socio-demographic factors that may otherwise affect their dental health.

## Ethics of community water fluoridation

CWF, like most public health measures, has to balance the inherent tension between protecting valued individual rights and achieving positive societal goals such as avoided disease and greater equity or fairness in health. While individual choice should be preserved when possible, exceptions exist if there is a significant benefit to the broader community. The benefits of fluoridation significantly outweigh its potential negative effects and therefore justify limiting the freedom of choice for people who do not wish to have their water fluoridated. In addition, fluoride toothpaste and dental treatments alone will not reduce inequalities (unfair differences) in oral health because their use depends on individual behaviour and personal cost.

In a 2003 Section 7 Charter of Rights and Freedoms analysis, the Supreme Court of British Columbia dismissed an applicant's claims for damages for personal injuries resulting from the fluoridation of public water. The Court determined that adding fluoride (a naturally occurring substance in water) was different than adding a drug or medication that did not naturally occur. Fluoridation at optimum levels was a minimal intrusion into a person's right to liberty and security of the person, which are protected under the Charter.

The odds of having caries are significantly greater in people with low education levels (or low parental education) or low income (19). A recent study of the impact of the cessation of CWF in Calgary on dental caries in children demonstrated increasing inequities in oral health in the absence of CWF (20).

In 2007 the Nuffield Council on Bioethics (UK) advised that the reduction of ill health and reduction of health inequalities, especially among children, make fluoridation justifiable when balanced against the principles of avoiding coercive interventions and minimizing interventions in personal life (21).

## Conclusion

The best available scientific evidence supports fluoridation as a safe and effective public health measure to improve oral health and reduce dental caries. Alberta Health values the oral health of Albertans and supports fluoridation as a public health approach to minimize dental disease and related complications.

Municipal governments can be confident that the use of CWF at the recommended level does not pose a risk to public health, that it promotes the oral health of the population, and reduces inequities within communities.

Alberta Health, along with Alberta Health Services, Health Canada, the Public Health Agency of Canada, the United States Centers for Disease Control, and the World Health Organization, continue to monitor scientific evidence on this issue and continue to support fluoridation as a safe and effective way to prevent dental disease.



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