

# New international review supports community water fluoridation as an effective and safe dental health promotion measure

Peter Howat<sup>A</sup>, Colin Binns<sup>A</sup> and Jonine Jancey<sup>A,B</sup>

<sup>A</sup>School of Public Health, Curtin University, GPO Box U1987, Perth, WA 6845, Australia.

<sup>B</sup>Corresponding author. Email: [jjancey@curtin.edu.au](mailto:jjancey@curtin.edu.au)

## Overview of the issue

Fluoridation of community water supplies has proven to be a simple, cheap and effective preventive health measure that has brought enormous benefits to dental health throughout the world.<sup>1–4</sup> The initiative is particularly relevant to health promotion as it highlights a policy measure, akin to vaccination, whereby the intervention provides immense benefit with little effort required by the recipient.<sup>5</sup>

Community water fluoridation (CWF) receives huge support from credible mainstream public health professionals and experts in the field. International endorsement of water fluoridation comes from the World Health Organisation (WHO), United States' Centers for Disease Control and Prevention, US Surgeon General, Royal Society of New Zealand,<sup>1–4</sup> and in Australia, the National Health and Medical Research Council and state governments.<sup>6,7</sup>

A recent report from the Royal Society of New Zealand, based on all significant literature and re-analyses of relevant research, has refuted any dangers of CWF when used appropriately and re-affirmed its substantial benefits to oral health.<sup>2</sup> However, sadly, over many years this evidence-based international support for CWF has had to fight misinformation disseminated by a small minority of detractors who claim that CWF is dangerous.

Frieden<sup>8</sup> noted that many successful public health interventions have been opposed by specific interest groups, so water fluoridation is not alone in attracting the attention of vocal opponents. Other successful public health actions that have been vigorously opposed include vaccination, smoke-free workplace laws, disease reporting, environmental protection and motor vehicle safety. In the case of tobacco, opposition has been driven by commercial interests. In other interventions, although substantial net benefits to the public's health have been evident, far outweighing the costs of implementation, most individuals do not experience immediate benefits, and often a small but vocal group opposes the program vigorously.

## What is the status of water fluoridation?

The first fluoridated drinking water supply dates back to Grand Rapids, Michigan, in the United States (US), in 1945. Today almost three-quarters of the US population has access to fluoridated drinking water, as do over 370 million people located in 30 countries.<sup>2,9</sup>

Some small countries such as Hong Kong and Singapore have 100% access to fluoridated water,<sup>9</sup> while Australia has one of the highest fluoridation rates in the world at 80%. First introduced to Australia in 1953, access to CWF ranges from a high of 96% in New South Wales (NSW) and 86% in Queensland to 70% in the Northern Territory.<sup>2</sup> Yet less than 60% of New Zealanders live in communities with access to CWF. Unfortunately, New Zealand (NZ) has been subjected to regular scare campaigns by misinformed fluoridation opponents. This has resulted in some cities never introducing fluoride (e.g. Christchurch and Tauranga), while other communities have had different experiences. For example, in Hamilton, residents voted for the removal of fluoride after its introduction; it was re-introduced in 2013 following a referendum.<sup>2</sup> It is likely to be an ongoing challenge to ensure that the rate of fluoridation does not decrease (let alone to increase it) through the actions of ill-informed opponents.

Recent reports from parts of northern NSW without CWF record young children being hospitalised for mass extractions of rotten teeth at nearly twice the rate of other children across NSW. The rate of dental decay in the region is reported as 'extremely high', especially among children from lower socioeconomic status (SES) backgrounds.<sup>10</sup>

This situation prompted the Australian Dental Association to urge the federal government to persuade councils, swayed by 'fringe groups who peddle fear and conspiracy theories', to embrace water fluoridation.<sup>6</sup>

## What is the effectiveness and safety of water fluoridation?

There have been notable improvements in oral health in the last decade globally, particularly in developed countries like NZ and Australia. Nevertheless, tooth decay is still the single most common chronic disease, with significant health and economic consequences. It is an irreversible disease, often occurring early in life and progressing to pervasive decay in adulthood. Hence, it is essential that prevention begins in childhood and continues throughout the lifespan.<sup>2</sup> Fluoride effectively protects against tooth decay by preventing demineralisation of tooth enamel due to acid-producing plaque bacteria. Drinking fluoridated water is the most

efficacious way of ensuring the use of fluoride through both topical and systemic actions.<sup>11</sup>

A recent study (*Health Effects of Water Fluoridation: a Review of the Scientific Evidence*) has refuted any dangers of water fluoridation when used appropriately. The review of scientific evidence has found that NZ fluoridation levels create no health risks and provide protection against tooth decay. The review was commissioned by Sir Peter Gluckman, the NZ Prime Minister's chief science adviser, and Royal Society of New Zealand's president Sir David Skegg at the request of the Auckland City Council.<sup>2</sup>

Scientific literature was evaluated by a panel of five experts, along with a lay observer with local government experience. The report was reviewed by three international experts and the director of NZ's National Poisons Centre.

The panel paid particular attention to the major contentions about potential harm caused by fluoride. This included the unsubstantiated assertions by opponents to fluoridation that it may contribute to the risk of cancers and cardiovascular, metabolic, musculoskeletal and hormonal disorders, as well as having adverse effects on brain development.

The panel concluded that the concerns raised by those opposed to fluoridation are not supported by the scientific evidence. The panel reported that the few studies suggesting a cancer link with community water fluoridation suffered from poor methodology and errors in analysis. The only supported side effect of fluoridation was mild dental fluorosis, a defect of tooth enamel.

'The review finds compelling evidence that fluoridation of the water at the established and recommended levels produces broad and continuing benefits for the dental health . . .', Gluckman said. 'The public can be reassured on the basis of robust scientific data that the implementation of this public health measure poses no risk of adverse health effects.'<sup>2</sup>

The scientific consensus, confirmed by recent reviews of more than 50 years of research, verifies the effectiveness of water fluoridation and a lack of significant or realistic risks. Nevertheless, there is ongoing surveillance and monitoring of populations receiving fluoridated water.<sup>2</sup>

Provision of CWF is only part of the solution to controlling dental caries in Australian children: dental hygiene practices, such as regular brushing and flossing, as well as regular tap water consumption, are also required. A study of Perth metropolitan year-two public primary school children found that up to 60% drank mostly tap water at home when they were thirsty. Milk was the drink of choice at breakfast and soft drinks were their main drink while watching television.<sup>12</sup>

### **Why is fluoridation opposed?**

The opposition to water fluoridation is underpinned by the view that it conveys unacceptable risk to public health, along with the

argument that adding fluoride to water supplies infringes individual rights.<sup>2</sup>

The opposition to fluoridation is akin to the anti-vaccination movement, with many unsubstantiated arguments and strategies. It is very hard to understand the stance in light of the weak arguments that do not stand up to scientific scrutiny. It appears that many of the small but vocal group of critics lack relevant health training and fail to use carefully conducted scientific research to support assertions.<sup>2</sup> While they have websites and organisations that attempt to provide an air of respectability and credibility, there is no respected health agency anywhere in the world that opposes fluoridation.

### **Implications for health promotion**

Globally, many people are denied the benefits of CWF. Australia is fortunate to have some of the highest rates of CWF coverage in the world; however, the ongoing actions of fluoride opponents should not be taken lightly. They can influence the reversal of CWF over a relatively short period, just as their misinformation campaigns can influence communities that lack CWF to maintain that stance. An ongoing awareness is needed in communities where anti-fluoride campaigners operate, and maintaining local government councillors' understanding of the safety and effectiveness of water fluoridation is essential. Politicians at state and federal level would also benefit from ongoing reminders.

The final decision for fluoridation of water supplies should be made by the federal or central government as advised by the Department of Health, which has the appropriate expertise and objectivity. Local government councillors should not be entrusted with this important task; they generally lack the relevant knowledge, and are often concerned about local community sentiment and a desire to retain their seats on council.

CWF has close alignment with the social determinants of health, which is one of the foci for health promotion globally. The most deprived SES groups have the highest rates of tooth decay, and evidence indicates that the benefits of water fluoridation are greatest for this group.<sup>13</sup> An important benefit for disadvantaged communities is that CWF is a health promotion policy measure that does not need active behavioural action by the target audience.<sup>5</sup> For example, the introduction of water fluoridation in 2005 to five remote Indigenous communities where dental health was very poor resulted in significant reductions in both the prevalence and severity of dental caries by 2012.<sup>14</sup> Another example, the Cicketik and colleagues'<sup>15</sup> analysis of the benefits of water fluoridation applied to the non-fluoridated City of Brisbane, indicated significant monetary savings from substantial oral health benefits should the city's water supplies be fluoridated. The predicted benefits were much greater for children from disadvantaged backgrounds.

While education of families is important for promoting good oral health, children from low SES groups are less likely to respond. Inadequate health literacy, medical/dental jargon and oral health

education materials that lack clear consistent messages can be confusing for parents from disadvantaged backgrounds.<sup>16</sup>

The popularity of bottled water must also be considered as tests on bottled water indicate negligible levels of fluoride. Consequently, people who drink bottled water instead of tap water in areas of CWF are being deprived of the dental health benefits of fluoride.<sup>17</sup> Also, infant formula is designed to be mixed with fluoridated water and the use of bottled water is not recommended in its preparation.<sup>18</sup> In order to alert regular users of bottled water to these concerns, awareness interventions were recommended, including labelling that indicates whether the bottled water contains adequate levels of fluoride to advance dental health.<sup>12,17</sup>

## Conclusions

Strong evidence supports the safety and efficacy of CWF. The benefits are most pronounced for low SES groups. However, opponents of fluoridation through dissemination of misinformation pose an ongoing threat to CWF's continuation. Public health professionals have a responsibility to counter such misinformation and to support water fluoridation.

## Disclosure

PH was involved in advocacy of fluoridation of community water supplies in New Zealand in the late 1970s. He was also a Councillor for the City of South Perth, 2010–13.

## References

- Centers for Disease Control and Prevention Recommendations for using fluoride to prevent and control dental caries in the United States. *MMWR Morb Mortal Wkly Rep* 2001; **50**(RR-14): 1–42.
- Royal Society of New Zealand. Health effects of water Fluoridation: a review of the scientific evidence. Wellington: Royal Society of New Zealand; 2014. Available from: <http://www.royalsociety.org.nz/expert-advice/commissioned-reviews/yr-2014/health-effects-of-water-fluoridation/> [Verified 20 December 2015].
- U.S. Department of Health and Human Services. Oral health in America: a report of the Surgeon General. Rockville, MD: U.S. Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health; 2000.
- World Health Organisation. Fluoride in drinking-water. Background document for development of WHO Guidelines for Drinking-water Quality. Geneva: WHO; 2004.
- Howat P, Maycock B, Cross D, Collins J, Jackson L, Burns S, *et al*. Towards a more unified definition of health promotion. *Health Promot J Austr* 2003; **14**(2): 82–4.
- Milman O. Water fluoridation: what does the rest of the world think? *The Guardian* 17 September 2013. Available from: <http://www.theguardian.com/world/2013/sep/17/water-fluoridation> [Verified 12 February 2015].
- National Health and Medical Research Council. A systematic review of the efficacy and safety of fluoridation. Canberra: NHMRC, Australian Government; 2007.
- Frieden TR. Six components necessary for effective public health program implementation *Am J Public Health* 2014; **104**(1): 17–22. doi:10.2105/AJPH.2013.301608
- British Fluoridation Society. The extent of water fluoridation. In One in a million: the facts about water fluoridation, 3rd edition. London: British Fluoridation Society; 2012.
- Power J. Decay in non-fluoride areas rivals Third World. *Sydney Morning Herald* 1 September 2013. Available from: <http://www.smh.com.au/national/health/decay-in-nonfluoride-areas-rivals-third-world-20130831-2sxxg4.html> [Verified 12 February 2015].
- Selwitz RH, Ismail AI, Pitts NB. Dental caries. *Lancet* 2007; **369**(9555): 51–9. doi:10.1016/S0140-6736(07)60031-2
- Leavy JE, Heyworth J, Middleton A, Rosenberg M, Woloszyn M. Tap into good teeth – a Western Australian pilot study of children's drinking patterns. *Health Promot J Austr* 2012; **23**(1): 42–7.
- McGrady MG, Ellwood RP, Maguire A, Goodwin M, Boothman N, Pretty IA. The association between social deprivation and the prevalence and severity of dental caries and fluorosis in populations with and without water fluoridation. *BMC Public Health* 2012; **12**: 1122. doi:10.1186/1471-2458-12-1122
- Johnson NW, Laloo R, Kroon J, Fernando S, Tut O. Effectiveness of water fluoridation in caries reduction in a remote Indigenous community in Far-North Queensland. *Aust Dent J* 2014; **59**(3): 366–71. doi:10.1111/adj.12190
- Ciketic S, Hayatbakhsh MR, Doran CM. Drinking water fluoridation in South East Queensland: a cost-effectiveness evaluation. *Health Promot J Austr* 2010; **21**(1): 51–6.
- Arora A, Bedros D, Bhole S, Eastwood J, Moody G. A qualitative evaluation of the views of child and family health nurses on early childhood oral health education materials in New South Wales, Australia. *Health Promot J Austr* 2012; **23**(2): 112–6.
- Cochrane NJ, Saranathan S, Morgan MV, Dashper SG. Fluoride content of still bottled water in Australia. *Aust Dent J* 2006; **51**(3): 242–4. doi:10.1111/j.1834-7819.2006.tb00436.x
- National Health and Medical Research Council. Infant Feeding Guidelines. Canberra: NHMRC, Australian Government; 2012.