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Title: A new international review supports community water fluoridation as an effective and safe dental health promotion measure.

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Overview of the 'issue'
Fluoridation of community water supplies has proven to be a simple, cheap and effective preventive health measure that has had brought enormous benefits to dental health throughout the world. (1-4) 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. (5)

Community water fluoridation (CWF) receives a huge amount of 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(US) Centres for Disease Control and Prevention, US Surgeon General, Royal Society of New Zealand (NZ) (1-4), the National Health and Medical Research Council, and State governments. (6-7)

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. (2) 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 (8) 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 this has been driven by commercial interests. However, in other interventions although substantial net benefits to the public's health were 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 US, in 1945. Today almost three quarters of the US population have access to fluoridated drinking water as do over 370 million people located in 30 countries. (2,9)

Some small countries such as Hong Kong and Singapore have 100% access to fluoridated water (9), 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), 86% in Queensland to 70% in the Northern Territory.(2) Yet less than 60% of New Zealanders live in communities with access to CWF. Unfortunately, New Zealand has been subjected to regular 'scare' campaigns by misinformed fluoridation opponents. This has resulted in in some cities never introducing fluoride (e.g. Christchurch and Tauranga), other communities voting for its

removal once introduced (e.g. Hamilton) and then being re-introduced in late 2013 following a referendum of residents. (2) There is likely to be an ongoing challenge to increase this rate let alone ensuring it is not decreased through the actions of ill-informed opponents.

These challenges are illustrated by recent reports of young children from parts of Northern NSW without CWF being hospitalised for mass extractions of rotten teeth at nearly twice the rate of other children. The rate of dental decay in the region is reported as ''extremely high'', especially among children from lower socio-economic status (SES) backgrounds**.** (10)

The situation prompted the Australian Dental Association to urge the Federal Government to use its influence to force Councils, swayed by ''fringe groups who peddle fear and conspiracy theories'' to embrace water fluoridation. (6)

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 New Zealand 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 then tending to progress to pervasive decay in adulthood. Hence, it is essential that prevention occur from childhood, throughout the lifespan. (2) Fluoride provides a protective effect against tooth decay by preventing demineralization of tooth enamel due to acid-producing plaque bacteria. Drinking fluoridated water is the most efficacious way of achieving this through both topical and systemic actions. (11)

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 New Zealand 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 president Sir David Skegg at the request of the Auckland City Council. (2)

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 the 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, cardiovascular, metabolic, musculoskeletal and hormonal disorders, as well as 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 that suggested 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."(2)

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. (2)

Provision of CWF is only part of the answer to control of dental caries in Australian children: they also need to practice dental hygiene such as regular brushing and flossing, as well as drink tap water regularly. 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. (12)

Why is there opposition to fluoridation?
The opposition to water fluoridation is underpinned by a viewpoint that it conveys unacceptable risk to public health, along with the argument that adding fluoride to water supplies infringes individual rights. (2)

The opposition to the fluoridation is akin to anti-vaccination movement with many unsubstantiated arguments and strategies. It is very hard to understand the stance in light of the very 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. (2) They have websites and organisations that attempt to provide an air of respectability and credibility, however, there is no respected health agency anywhere in the world that opposes fluoridation.

Implications for health promotion
Many people throughout the world are denied the benefits of CWF. Fortunately, the Australian population has some of the highest rates of CWF in the world. However, the ongoing actions of fluoride opponents should not be taken lightly as they can influence reversals of CWF over a relatively short period, just as their misinformation campaigns can influence communities that lack CWF to maintain that stance. There is a need for ongoing awareness in communities where these anti-fluoride campaigners operate, and special efforts are needed to continue to maintain the local government councillors understanding of the safety and effectiveness of water fluoridation. All politicians at State and Federal level would also probably benefit from such ongoing reminders. The final decision for fluoridation of water supplies should be with 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 as they generally lack the relevant knowledge and many are too concerned about pandering to local community sentiment 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. (13) An important benefit of CWF for disadvantaged communities is that it is a health promotion policy measure that is less influenced by a need for active behavioural action by the target audience. (5) An example is the introduction of water fluoridation in 2005 to five remote Indigenous communities where dental health was very poor, which resulted in significant reductions in both the prevalence and severity of dental caries by 2012. (14) Another example comes from Ciketik and colleagues'(15) (2010) analysis of the benefits of water fluoridation applied to the non-fluoridated City of Brisbane that indicated potential significant monetary savings from substantial oral health benefits should the city's water supplies be fluoridated. The predicted benefits were much greater for children of 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 coupled with oral health education materials that lack clear consistent messages and medical/dental jargon can be confusing for parents from disadvantaged backgrounds. (16)

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. (17) Also infant formula is designed to be mixed with fluoridated water and the use of bottled water is not recommended in its preparation. (18) This concern has led to recommendations that regular users of bottled water would benefit from awareness interventions including labelling that indicates whether the bottled water contains adequate levels of fluoride to advance dental health. (12,17)

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 a threat to its 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 [##].

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