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Editorial

Community Water fluoridation

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Since the discovery of the caries preventive benefits of fluoride, it has been the cornerstone of preventive programs for children and adults. Water fluoridation, the controlled addition of a precise amount of fluoride to community water systems to the level beneficial for dental health, is one of the most effective and safe means to deliver fluoride (McDonagh *et al.*, 2000; National Health and Medical Research Council, 2017). In 1999, the US Centers for Disease Control and Prevention (CDC) named fluoridation of drinking water as one of ten great public health achievements in the 20th Century, alongside vaccination, control of infectious diseases, a decline in death from coronary heart disease and other accomplishments (CDC, 2011). This is a remarkable recognition of the impact of dental conditions and the importance of a dental preventive program.

The history started with research led by Dean in 21 cities in 10 US states to investigate the entangled relationship between fluoride in water, dental caries and fluorosis (Dean, 1947b). An initial investigation of 'mottled enamel' that was associated with fluoride level in the water later led to an observation of a 'dose-response' relationship between fluoride level in drinking water and dental caries (Dean, 1947a; 1947b). Using these data, an intersection at or around 1mg F/litre of water was discovered as the ideal balance of prevention of caries with little occurrence of dental fluorosis of public health importance. This balance has been the core of community water fluoridation (CWF) programmes worldwide. Efforts and improvements in refining this balance have also been made (Spencer *et al.*, 2018), and policy has evolved globally (Whelton *et al.*, 2019). Since the commencement of community water fluoridation in Grand Rapids, Michigan, USA, in 1945, some 400 million people in 25 countries now receive fluoridated drinking water (Aggeborn and Öhman, 2021; British Fluoridation Society, 2021a), contributing to the prevention of dental caries in children and adults (Iheozor-Ejiofor *et al.*, 2015). CWF has been endorsed by WHO (Fawell *et al*., 2006), the Fédération Dentaire Internationale (FDI World Dental Federation, 1993) and many national dental and health organisations.

The recent decline in dental caries experience and widespread availability of other fluoride sources such as fluoridated toothpaste (Bratthall *et al.*, 1996) has raised questions about the role of CWF in the contemporary environment. While a decline in dental caries has been documented, it has remained a global public health problem (Watt *et al.*, 2019). Importantly, socioeconomic inequalities have remained and even widened, requiring radical actions that are also equitable. CWF, as a population strategy, can have a whole-population impact as it delivers controlled levels of fluoride with minimal individual efforts or behavioural changes. Such a mode of action leads to a more significant population impact than methods that require higher individual efforts (Frieden, 2010). CWF works across different social contexts as the evidence of its effectiveness has been consistently reported from studies conducted in different populations (National Health and Medical Research Council, 2017; Aggeborn and Öhman, 2021). There has also been evidence of CWF reducing socioeconomic inequalities in dental caries. Hence, CWF retains its role as an important population-based dental preventive programme.

To consolidate the efforts worldwide, the WHO Director General has called for community-based interventions such as water fluoridation in order to promote a healthy environment (World Health Organisation, 2021). However, issues remain in implementing CWF schemes around the world. These can range from the availability and robustness of water system infrastructure, a lack of funds to invest in oral health measures, different political and philosophical attitudes to public health and oral health measures and the legislative context for introducing new fluoridation schemes (Esfandiari *et al.*, 2010).

Whilst around 6 million residents in England are covered by CWF schemes, most schemes were set up over 40 years ago. Numerous changes in the legislative framework have occurred in the period since. Under the Health and Social Care Act 2012, the responsibility for conducting consultations on proposals for new fluoridation schemes and the variation or termination of existing fluoridation schemes was transferred to local government (English Local Authorities) from 1 April 2013 (*The Water Fluoridation (Proposals and Consultation) (England) Regulations*, 2013).

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At the time, these responsibilities and regulatory changes were broadly supported, as they allowed decision making at a more local level and, in theory, simplified procedures. In 2016, Public Health England (PHE) published 'Improving oral health: a community water fluoridation toolkit' (Public Health England, 2016), providing a roadmap for local authorities interested in moving forward with CWF.

In the period that followed, several local authorities began to look at CWF. These were mainly in the north of England, where oral health is typically poorer. One of the areas was Hull, a city with amongst the worst child oral health in the country and considerable deprivation. The Local Dental Committee (LDC; a body representing dentists working in the area), working with Alan Johnson, the former UK Secretary of State for Health and the British Fluoridation Society (https://bfsweb.org), instigated a CWF campaign raising awareness within the area of the potential benefits for health that CWF could bring leading to the development of an information website 'One part per million' (https://onepartpermillion.co.uk) and social media feeds. This local campaign evolved into the National CWF Network, which now has membership across a number of dental organisations and charities. Over four successive years, Hull LDC has raised awareness of benefits and barriers and developing profession-led support for the public health measure.

This front-line clinically driven campaign has supported the long-term support for CWF at NHS England and PHE levels. Recently, CWF has been included within the NHS England menu of evidence-based interventions to reduce health inequality (https://www.england.nhs.uk/ltphimenu/). PHE continues to describe oral health inequality through the essential oral health surveys conducted and publish the fluoridation monitoring report (Public Health England, 2018) on a four-yearly basis. PHE have also published resources communicating the central messages around effectiveness and safety (Public Health England, 2020).

The PHE (2021) paper 'Inequalities in oral health in England' emphasised the effect of CWF schemes in reducing health inequality and the ambition that "children from all backgrounds should expect to grow up free from tooth decay as part of having the best start in life, and that all adults should have a healthy mouth as part of living well".

Despite the continued positive messaging around CWF, progress on implementing schemes has remained slow. Before 2013, the responsibilities lay with regional NHS bodies, which were frequently subject to reorganisations. Whilst the 2013 changes moved the planning powers to more stable public bodies, they introduced further procedural steps, given the split of responsibility between central and local bodies. Also, the smaller geographical coverage of local authorities requires them to group together to enact CWF changes over the areas covered by the water infrastructure, adding further complication. In addition, local authorities wanting to implement new schemes must fund these schemes within their existing budgets.

The recently proposed legislation (a UK White Paper) 'Integration and Innovation: working together to improve health and social care for all' (Department of Health and Social Care, 2021) proposes streamlining the process for the implementation of CWF by moving the responsibilities from local authorities to central government, who will become responsible for the associated work, the costs of feasibility studies and the capital and revenue costs of schemes. These proposals address the concerns that local authorities currently bear the burden of administration and costs related to initiating CWF when they do not benefit financially from the significant return in investment, with the NHS reaping these rewards. Proposed schemes will still be subject to public consultation as part of this process.

Since CWF schemes are subject to public consultations for initiation and continuation, studies on public opinions have been conducted over the years in many countries to understand the public's attitude towards water fluoridation and its reasons. Studies conducted in Canada (Perrella and Kiss, 2015) and Australia (Knox *et al.*, 2017) revealed that individuals with higher incomes, more frequent visits to dentists, and better knowledge of fluoride were more likely to support CWF. The British Fluoridation Society (2021b) commissioned nationwide opinion polls in 1980, 1985, 1987, 1992, 1997, and 2003 asking the question, "Do you think fluoride should be added to water if it can reduce tooth decay?" and reported that between two-thirds and three-quarters of people have been found to support adding fluoride to water to reduce tooth decay. A further British Fluoridation Society survey conducted in 2019 in the North East of England found significant continued support for fluoridation (Lowry *et al.*, 2021).

Against this backdrop with 51% of the UK internet users seeking health information online (Office for National Statistics, 2016), the prevalence of conflicting information about CWF on the internet is concerning due to its potential impact on public opinion (Vasantavada *et al.*, 2021). A recent online survey among adults in the UK found that though 70% of the respondents knew that the purpose of adding fluoride to water is to impart dental health benefits, only 50% considered fluoridated water to be safe for consumption and 62% believed that there should be an option to opt-in or out of CWF for their individual water supply. These results indicate a need for better public engagement by dental health professionals and health authorities regarding water fluoridation in the UK (Vasantavada *et al.*, 2020).

However, in the UK, the profession is more aligned than ever in the campaign to improve oral health in a targeted way reducing preventable disease, reducing inequality, and improving overall health and quality of life. The evidence for CWF as a population-based measure for reducing inequalities remains strong. In England, legislative changes may facilitate positive change, but any new schemes will still require public consultation and campaigns to improve public opinion of CWF will be vital, with the profession having a crucial role to play.

References

Aggeborn, L. and Öhman, M. (2021): The Effects of Fluoride in Drinking Water. *Journal of Political Economy* **129**, 465–491.

Bratthall, D., Hänsel-Petersson, G. and Sundberg, H. (1996): Reasons for the caries decline: what do the experts believe? *European Journal of Oral Sciences* **104**, 416–422; discussion 423-425, 430–432.

British Fluoridation Society (2021a): *Extent of Water Fluoridation – British Fluoridation Society*. https://bfsweb.org/extent/ (Accessed: 15 July 2021).

British Fluoridation Society (2021b) *Opinion surveys – British Fluoridation Society*. https://bfsweb.org/opinion-surveys/ (Accessed: 16 July 2021).

Centers for Disease Control and Prevention (2011): Ten great public health achievements--United States, 2001-2010, *Morbidity and Mortality Weekly Report* **60**, 619–623.

Dean, H. (1947a) Epidemiological studies in the United States, in Moulton, F. (Ed.) *Dental caries and fluorine*. Washington DC: American Association for the Advancement of Science.

Dean, H. (1947b) The investigation of physiological effects by the epidemiological method, in Moulton, F. (Ed.) *Dental Caries and Fluorine*. Washinton DC: American Association for the Advancement of Science.

Department of Health and Social Care (2021): *Integration and innovation: working together to improve health and social care for all (HTML version)*, *GOV.UK*. Available at: https://www.gov.uk/government/publications/working-together-to-improve-health-and-social-care-for-all/integration-and-innovation-working-together-to-improve-health-and-social-care-for-all-html-version (Accessed: 16 July 2021).

Esfandiari, S., Jamal, N. and Feine, J. (2010): Community-specific, preventive oral health policies: preventive measures on dental caries. *Journal of Investigative and Clinical Dentistry* **1**, 2–7.

Fawell, J.K., Bailey, K., Chilton, J., Dahi, E., Fewtrell, L. and Magara, Y. (2006): *Fluoride in drinking-water*. London: IWA.

FDI World Dental Federation (1993): FDI Policy statement on fluorides and fluoridation for the prevention of dental caries. *Dental World* **2**, 11–15.

Frieden, T.R. (2010): A framework for public health action: the health impact pyramid. *American Journal of Public Health* **100**, 590–595.

Iheozor-Ejiofor, Z., Worthington, H.V., Walsh, T., O'Malley, L., Clarkson, J.E., Macey, R., Alam, R., Tugwell, P., Welch, W. and Glenny, A-M. (2015): Water fluoridation for the prevention of dental caries. *Cochrane Database of Systematic Reviews* 6. CD010856.

Knox, M.C., Garnera, A., Dyasona, A., Pearsona, T. and Pit, S.W. (2017): Qualitative investigation of the reasons behind opposition to water fluoridation in regional NSW, Australia. *Public Health Research & Practice* **27**, 2711705.

Lowry, R.J., Brophy, R. and Lennon, M.A. (2021): Public attitudes to water fluoridation in the North East of England. *British Dental Journal*, 1–4. doi: 10.1038/s41415-021-3074-0.

McDonagh, M.S., Whiting. P.F., Wilson, P.M., Sutton, A.J., Chestnutt, I., Cooper, J., Misso, K., Bradley, M., Tresasure, E. and Kleijnen, J. (2000): Systematic review of water fluoridation. *BMJ* **321**, 855–859.

National Health and Medical Research Council (2017): *Water fluoridation: dental and other human health outcomes*. Canberra: National Health and Medical Research Council. https://www.nhmrc.gov.au/about-us/publications/water-fluoridation-dental-and-other-human-health-outcomes (Accessed: 15 July 2021).

Office for National Statistics (2016) *Internet access – households and individuals, Great Britain - Office for National Statistics*. https://www.ons.gov.uk/peoplepopulationandcommunity/householdcharacteristics/homeinternetandsocialmediausage/bulletins/internetaccesshouseholdsandindividuals/2016 (Accessed: 16 July 2021).

Perrella, A.M.L. and Kiss, S.J. (2015): Risk perception, psychological heuristics and the water fluoridation controversy. *Canadian Journal of Public Health = Revue Canadienne De Sante Publique* **106**, e197-203.

Public Health England (2016): *Improving oral health: community water fluoridation toolkit*, *GOV.UK*. https://www.gov.uk/government/publications/improving-oral-health-community-water-fluoridation-toolkit (Accessed: 16 July 2021).

Public Health England (2018): *Water fluoridation: health monitoring report for England 2018*. https://www.gov.uk/government/publications/water-fluoridation-health-monitoring-report-for-england-2018 (Accessed: 16 July 2021).

Public Health England (2020): *Water Fluoridation resources - Public library - PHE national - Knowledge Hub*. https://khub.net/web/phe-national/public-library/-/document_library/v2WsRK3ZlEig/view/210540449?_com_liferay_document_library_web_portlet_DLPortlet_INSTANCE_v2WsRK3ZlEig_redirect=https%3A%2F%2Fkhub.net%3A443%2Fweb%2Fphe-national%2Fpublic-library%2F-%2Fdoc (Accessed: 16 July 2021).

Public Health England (2021): *Inequalities in oral health in England*. https://www.gov.uk/government/publications/inequalities-in-oral-health-in-england (Accessed: 16 July 2021).

Spencer, A.J., Do, L.G., Mueller, U., Baines, J., Foley, M. and Peres, M.A. (2018): Understanding Optimum Fluoride Intake from Population-Level Evidence. *Advances in Dental Research* **29**, 144–156.

The Water Fluoridation (Proposals and Consultation) (England) Regulations (2013): *2013/301*. Queen's Printer of Acts of Parliament. https://www.legislation.gov.uk/uksi/2013/301/contents/made (Accessed: 16 July 2021).

Vasantavada, P.V., Sanderson, R., Ells, L. and Zohoori, F.V. (2020): Public Perception of Community Water Fluoridation in the UK. *Caries Research 67th ORCA Congress*, pp. 369–457. doi: 10.1159/000511860.

Vasantavada, P.V., Sanderson, R., Ells, L. and Zohoori, F.V. (2021) Web search engines reveal conflicting information about 'Water Fluoridation', *British Dental Journal*, In press.

Watt, R.G., Daly, B., Allison, P., Macpherson, L.M.D., Venturelli, R., Listl, S., Weyant, R.J., Mathur, M.R., Guarnizo-Herreno, C.C., Celeste, R.K., Peres, M.A., Kearns, C. and Bensian, H. (2019): Ending the neglect of global oral health: time for radical action. *Lancet* **394**, 261–272.

Whelton, H.P., Spencer, A.J., Do, L.G. and Rugg-Gunn, A.J. (2019): Fluoride Revolution and Dental Caries: Evolution of Policies for Global Use. *Journal of Dental Research* **98**, 837–846.

World Health Organisation (2021): *Consolidated report by the Director-General*. Gemeva: WHO. A74/10 Rev.1, 21.