FLUORIDE
Quarterly Journal of the International Society for Fluoride Research

Choppy waters continuing for community water fluoridation

Bruce SPITTLE[1]

[1]Rotating Editor-in-Chief, *Fluoride*, Dunedin, New Zealand
*Corresponding author:
Bruce Spittle
Rotating Editor-in-Chief, *Fluoride*
727 Brighton Road
Ocean View
Dunedin, 9035
New Zealand
Phone: (+64) 0274732097
and (+64)034811418
E-mail: spittle727@gmail.com
Accepted: 2025 Mar 14
Published as e334: 2025 Mar 15

ABSTRACT

Two recent publications reached opposing views on the safety of community water fluoridation (CWF). A study by Singh et al., accepted on Feb 6, 2025, concluded that urinary fluoride concentrations measured prenatally and during childhood (child urinary fluoride concentrations above –0.47 on the $\log_2$ scale (corresponding to 0.72 mg/L) were associated with lower cognitive abilities, especially perceptual reasoning and verbal abilities, in Bangladeshi children. A New Zealand Ministry of Health, Manatu Hauora, evidence review of CWF, published 4 December 2024, found that this public health intervention was safe and effective for preventing dental caries. In addition the New Zealand review found that no high-quality evidence had been published since 2014 and 2021 to suggest a causal link between fluoride exposure at the levels used in Aotearoa New Zealand for CWF, 0.7–1.0 mg/L, and significant harm to health. It found that three studies for neurodevelopmental outcomes, including one by Grandjean et al. on over 1500 mother-child pairs, should be excluded from the review because they used a benchmark dose analysis of the amount of fluoride which led to the adverse effect of a decline in IQ of 1 or 5 IQ points, which was considered to be a wrong outcome. These opposing interpretations of the scientific literature have resulted in choppy waters continuing for community water fluoridation.

Key-words: *Community water fluoridation.*

Unique digital address (Digital object identifier [DOI] equivalent): https://www.fluorideresearch.online/epub/files/334.pdf

Following the three recent developments, of (i) a United States District Court ruling that community water fluoridation at 0.7 mg/L presents an unreasonable risk of injury to health;[1] (ii) a Cochrane Library report finding the benefits of community water fluoridation are slight and less than previously;[2] and (iii) the State Surgeon General of Florida recommending that community water fluoridation (CWF) is stopped in his state,[3,4] community drinking water continues to face choppy waters.[5]

An additional high quality prospective study of the impact of prenatal and IQ has been accepted for publication.[6] The authors, Singh et al. from Sweden and Bangladesh, noted that there are indications that fluoride exposure considered to be beneficial for dental health may not be safe from a neurodevelopmental perspective. Their objective was to assess the impact of prenatal and childhood fluoride exposure on cognitive abilities at 5 and 10 years of age. Their method was to study 500 mother-child pairs from the MINIMat (Maternal and Infant Nutrition Interventions in Matlab) birth cohort in rural Bangladesh. Urinary fluoride concentrations were measured in the pregnant women at gestational week 8 and in their children at 5 and 10 years, using an ion-selective electrode and adjusting for specific gravity. Cognitive abilities were assessed using the Wechsler Preschool and Primary Scale for

Intelligence-Third Edition and the Wechsler Intelligence Scale-Fourth Edition at age 5 and 10 years, respectively. Associations of urinary fluoride concentrations (log_2-transformed) with cognitive abilities (raw scores) were assessed with multivariable-adjusted linear or spline regression models. Water fluoride concentrations were measured at the 10-year-old visit. The results showed that the maternal urinary fluoride concentrations (median: 0.63 mg/L, 5th–95th percentiles: 0.26–1.41 mg/L) were inversely associated with full-scale raw scores at 5 and 10 years (B [95% confidence interval]: –2.8 [–5.1, –0.6] and –4.9 [–8.0, –1.8], respectively, by exposure doubling). In cross-sectional analysis at 10 years, child urinary fluoride (overall median: 0.66 mg/L, 5th–95th percentiles: 0.34–1.26 mg/L) above –0.47 on the log_2-scale (corresponding to 0.72 mg/L) was inversely associated with fullscale raw scores (B [95% CI]: –12.1 [–21.2, –3.0]). The association at 5 years was also negative but nonsignificant. For both prenatal and childhood exposure, associations were most noticeable with perceptual reasoning, but also with verbal scores. The estimate for the association between urinary fluoride at 10 years and perceptual reasoning became 18% lower after adjustment for prenatal exposure. Non consistent sex-specific differences were observed. The authors concluded that urinary fluoride concentrations measured prenatally and during childhood (child urinary fluoride concentrations above –0.47 on the log_2 scale (corresponding to 0.72 mg/L) were associated with lower cognitive abilities, especially perceptual reasoning and verbal abilities, in Bangladeshi children.

On March 11, 2025, it was reported that Utah will become the first state to ban fluoride in public drinking water, despite widespread opposition from dentists and national health organizations.[7] Republican Govenor Spencer Cox said he would sign legislation that bars cities and communities from deciding whether to add the mineral to their water systems. The ban comes weeks after Federal Health Secretary Robert F. Kennedy Jr., who has expressed skepticism about water fluoridation, was sworn into office.[7]

In the opposite direction, some currents supporting community water fluoridation continue to flow.

An appeal has been filed against the United States District Court ruling that that community water fluoridation at 0.7 mg/L presents an unreasonable risk of injury to health.[8] On January 17, 2025, the Biden U.S. Environmental Protection Agency (EPA) filed a notice of appeal in the U.S. Court of Appeals for the Ninth Circuit. Food & Water Watch v. EPA (No. 25-384). Now that President Trump's nominee for EPA Administrator, Lee Zeldin, has been confirmed, it remains to be seen how the Trump EPA will proceed. A mediation conference was scheduled for February 26, 2025.

Before stepping down as Director-General of Health on 21 February 2025, Dr Diana Sarfati, considered community water fluoridation under the New Zealand Bill of Rights Act 1990 and reported, in a general information release on 4 December 2024, that community water fluoridation at optimal levels (0.7 –1.0 ppm) was safe and does not give rise to significant health risks.[9] One of documents supporting her analysis was a Ministry of Health, Manatu Hauora, publication Community Water Fluoridation: an evidence review, published on 4 December 2024.[10] This found that there had been no high quality evidence published since a report in 2014 by the Royal Society of New Zealand and the Office of the Prime Minister's Chief Science Advisor (OPMCSA)[11] and an updated 2021 review by the OPMCSA.[12] Appendix 3 of the 2024 review, an exclusion table for neurodevelopmental outcomes, gave some details of 41 studies that had been excluded.[10] Two studies by Grandjean et al.[13,14] and a study by Hirzy et al.[15] were excluded because they used the wrong outcome, a benchmark dose analysis.

Grandjean et al. noted that in their 2024 study of more than 1500 mother child pairs, obtained by merging studies from Denmark, Mexico and Canada, benchmark concentration (BMC) calculations were carried out to assess the maternal urinary fluoride concentration associated with a benchmark response of a one point reduction in the child full scale IQ (FSIQ) score, as compared with an unexposed mother and the same profile of covariates.[14] The findings from the three cohorts were used to calculate the joint benchmark concentration (BMC) and the lower confidence limit (BMCL) after adjustment for covariables.

Hirzy et al. noted that the benchmark dose method uses a computer program to fit dose response data and to determine a dose that results in a specified adverse effect level, known as the Benchmark Response (BMR) or the Point of Departure, (POD).[15] The program also yields the lower 95th confidence limit on the BMD referred to as the Benchmark Dose Lower-confidence Limit (BMDL). Hirzy et al. calculated the water fluoride level associated with a benchmark response of a five point reduction in the child FSIQ score.

The use of the BMC is a standard method used by the United States Environmental Protection Agency for the assessment of the toxicity of chemicals and the Grandjean et al. study was given considerable weight in the US District Court case that found that CWF at 0.7 mg/L presents an unreasonable risk of injury to health.[1] The 2024 New Zealand CWF evidence review does not expand on the reasons why it was valid to reject studies that used benchmark dose analysis as a measure of the fluoride levels in maternal urine or drinking water associated with a reduction in IQ of one or five IQ points.[10]

…On 10 February 2025, at a Rotorua Lakes District Council workshop on Community Water Fluoridation, two spokespersons for the Ministry of Health, Dr Riana Clark, Dental Public Health Specialist, Clinical Chief Advisor Oral Health Manata Hauora, and Dr Phil Shoemack, Public Health Physician, Medical Officer of Health Toi Te Ora (Health New Zealand), reassured the Council members that community water fluoridation, at the levels used in New Zealand of 0.7–1.0 mg/L, was safe, effective, affordable and equitable.[16] They noted that it was impossible to have too much fluoride from drinking fluoridated water and that an additional intake of 6 mg of fluoride a day from drinking tea would not be toxic. They observed that kidney disease was not a factor when it came to fluoride toxicity and that those with iodine deficiency were not at more risk of toxicity. Adding fluoride to water was described as treating the water and did not involve treating individuals. Some similarities were seen to be present between adding fluoride to water and adding chlorine to water, adding folic acid to flour, and adding iodine to salt. Making up infant formula with fluoridated water was not a concern as there were regulations which stopped manufacturers from adding fluoride to infant formula powder. The fluoride in the fluoridated water used to make up the formula was not seen to be a problem. In response to comments by Councillor Karen Barker on three studies linking fluoride to neurotoxicity, (i) the 2024 National Toxicology Program report,[17] (ii) a recent paper linking prenatal fluoride exposure and cognitive impairment [It likely that she was referring to Grandjean et al.,[14]] and (iii) the US District Court case,[1] Dr Clarke noted that most of these studies were from areas where .the fluoride level in drinking water were well over the 1.5 mg/L level and thus not a concern in New Zealand, where the goal was a fluoride level of 0.7 – 1.0 mg/L. In response to a question from Councillor Barker on the need for a ten fold margin of safety as suggested by EPA expert witness Dr Stanley Barone in the US District Court case, Dr Clark replied that the recent studies did not usurp the 70 years of experience in New Zealand with fluoridation and that there was no concern about general health effects. The only known toxic effect was mild dental fluorosis or speckling of the teeth.

Thus at present two differing interpretations of the scientific evidence are present. One is that community water with drinking water at 0.7 mg/L may cause developmental neurotoxicity and presents an unreasonable risk of health. The other is that community water with drinking water at 0.7 mg/L is safe and the only known toxic effect at this level was a small amount of dental fluorosis.

To change one's mind about the safety of CWF involves something of a paradigm shift, a process that may take some time[18] but the transition has been made by various individuals such as John Colquhoun[19] and Joseph Ladapo.[20]

The current opposing views have resulted in choppy waters continuing for community water fluoridation.

Bruce Spittle, Rotating Editor-in-Chief, *Fluoride*,
Dunedin, New Zealand

REFERENCES

[1] Findings of fact and conclusions of law. Signed by Judge Edward M. Chen on 9/24/2024. (emclc2) (Entered: 09/24/2024). Case 3:17-cv-02162-EMC. Document 445. Filed 09/24.24. Food & Water Watch, Inc., et al., Plaintiffs v. United States Environmental Protection Agency, et al., Defendants. United States District Court, Northern District of California. pp. 80. Available from: https://www.courtlistener.com/docket/6201332/445/food-water-watch-inc-v-environmental-protection-agency/

[2] Iheozor-Ejiofor Z, Walsh T, Lewis SR, Riley P, Boyers D, Clarkson JE, Worthington HV, Glenny AM, O'Malley L. Water fluoridation for the prevention of dental caries. Meta-Analysis Cochrane Database Syst Rev 2024 Oct 4;10(10):CD010856. doi: 10.1002/14651858.CD010856.pub3. Available from: https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD010856.pub3/full

[3] Labado. J. Guidance for community water fluoridaton. Florida Health, Nov 22, 2024. Available from: https://www.floridahealth.gov/_documents/newsroom/press-releases/2024/11/GUIDANCECommunityWaterFluoridation.pdf?utm_medium=email&utm_source=govdelivery

[4] Walsh S-M. Florida Surgeon General Ladapo bucks CDC, calls fluoridating water “health malpractice.”. Lakeland Ledger. Nov 22, 2024. Available from:

https://www.theledger.com/story/news/state/2024/11/22/florida-surgeon-general-coming-to-winter-haven-to-talk-about-water/76494300007/

[5] Spittle B. Is the tide is beginning to turn for community water fluoridation? [editorial]. Fluoride 2025;58(1):e308. Available from: https://www.fluorideresearch.online/epub/files/308.pdf

[6] Singh T, Gustin K, Rahman SM, Shiraji S, Tofail F, Vahter M, Kampouri M, Kippler M. Prenatal and childhood exposure to fluoride and cognitive development: findings from the longitudinal MINIMat cohort in rural Bangladesh Environ Health Perspect, DOI: 10.1289/ehp14534, Accepted 2/6/2025 Available from: https://ehp.niehs.nih.gov/doi/epdf/10.1289/EHP14534

[7]. Brown M, Schoenbaum H. Utah will be the first state to ban fluoride in drinking water. Associated Press News (AP). 2025 Mar 11. Available from: https://apnews.com/article/fluoride-ban-drinking-water-utah-559d92736f1958ff5d109071fa85f5b5

[8] Bergeson LL, Hutton CN. Biden EPA filed notice of appeal of ruling that typical levels of drinking water fluoridation present an unreasonable risk to health. Toxic Substances Control Act Blog. Posted 2025 Feb 13. In: National Law Review 2025 Mar 12;XV:(71). Available from: https://natlawreview.com/article/biden-epa-filed-notice-appeal-ruling-typical-levels-drinking-water-fluoridation

[9] Sarfati D. Director-General of Health consideration of community water fluoridation under the New Zealand Bill of Rights Act 1990. Ministry of Health, Manatu Hauora; Wellington: 2024 Dec 4. Available from: https://www.health.govt.nz/information-releases/director-general-of-health-consideration-of-community-water-fluoridation-under-the-new-zealand-bill

[10] Ministry of Health, Manato Hauora. Community water fluoridation: an evidence review. 2024 Dec 4. Available from: https://www.health.govt.nz/system/files/2024-12/community-water-fluoridation-evidence-review.pdf

[11] Bardsley A. Health effects of water fluoridation: A review of the scientific evidence. A report on behalf of the Royal Society of New Zealand and the Office of the Prime Minister’s Chief Science Advisor. 2014. Available from: https://www.royalsociety.org.nz/assets/documents/Health-effects-of-water-fluoridation-Aug-2014-corrected-Jan-2015.pdf

[12] Office of the Prime Minister’s Chief Science Advisor, Kaitohutohu Mātanga Pūtaiao Matua ki te Pirimia. Fluoridation: an update on evidence. Office of the Prime Minister’s Chief Science Advisor, Kaitohutohu Mātanga Pūtaiao Matua ki te Pirimia. 2012. Available from: https://www.pmcsa.ac.nz/topics/fluoridation-an-update-on-evidence/

[13] Grandjean P, Hu H, Till C, Green R, Bashash M, Flora D, Maria M, Rojo T, Song PXK, Lanphear B, Budtz-Jørgensen E. A benchmark dose analysis for maternal pregnancy urine-fluoride and IQ in children. Risk Anal 2022 Mar;42(3):439-49. doi: 10.1111/risa.13767. Epub 2021 Jun 8. Available from: https://pubmed.ncbi.nlm.nih.gov/34101876/

[14] Grandjean P, Meddis A, Nielsen F, Beck IH, Bilenberg N, Goodman CV, et al. Dose dependence of prenatal fluoride exposure associations with cognitive performance at school age in three prospective studies. Eur J Public Health 2024;34(1):143-9. Available from: https://doi.org/10.1093/eurpub/ckad170

[15] Hirzy JW, Connett P, Xiang QY, Spittle BJ, Kennedy DC. Developmental neurotoxicity of fluoride: a quantitative risk analysis towards establishing a safe daily dose of fluoride for children. Fluoride 2016;49(4 Pt 1):379-400. Available from: https://www.fluorideresearch.org/494Pt1/files/FJ2016_v49_n4Pt1_p379-400_pq.pdf

[16] Workshop on community water fluoridation. Rotorua Lakes District Council. 2025 Feb 10. Available from: https://www.youtube.com/watch?v=phGW-4qROis

[17] National Toxicology Program, Public Health Service, U.S. Department of Health and Human Services. NTP monograph on the state of science concerning fluoride exposure and neurodevelopment and cognition: a systematic review NTP Monograph 08. Research Triangle Park, North Carolina, USA: National Toxicology Program, Public Health Service, U.S. Department of Health and Human Services. 2024 Aug Available from: https://ntp.niehs.nih.gov/publications/monographs/mgraph08

[18] Spittle B. Fluoridation promotion by scientists in 2006: an example of “tardive photopsia.” Fluoride 2006;39(3):157-62. Available from: https://www.fluorideresearch.org/393/files/FJ2006_v39_n3_p157-162.pdf

[19] Colquhoun J. Why I changed my mind about water fluoridation. Perspectives in Biology and Medicine 1997;41:29-44. Reprinted with permission in Fluoride 1998;31(2):103-18. Available from: https://www.fluorideresearch.online/312/files/FJ1998_v31_n2_p059-128.pdf

[20] Dr Ladapo news conference on fluoride in water. Fox 13. Tampa Bay. [video on YouTube]. Available from: https://www.youtube.com/watch?v=JYrbDy7TltM&t=1508s