



THE REGIONAL MUNICIPALITY OF PEEL
COMMUNITY WATER FLUORIDATION COMMITTEE

AGENDA

CWFC - 2/2018

DATE: Thursday, July 5, 2018

TIME: 1:00 PM – 2:30 PM

LOCATION: Regional Council Chamber, 5th Floor
Regional Administrative Headquarters
10 Peel Centre Drive, Suite A
Brampton, Ontario

MEMBERS: F. Dale; J. Downey; J. Kovac; M. Palleschi; J. Sprovieri

Chaired by Councillor J. Downey or Vice-Chair Councillor J. Sprovieri

1. DECLARATIONS OF CONFLICTS OF INTEREST

2. APPROVAL OF AGENDA

3. DELEGATIONS

3.1. **Liesa Cianchino, Chair, Concerned Residents of Peel to End Fluoridation,** Regarding Water Fluoridation in Peel

3.2. **Christine Massey, Spokesperson, Fluoride Free Peel,** Regarding Water Fluoridation in Peel

4. REPORTS

4.1. Community Water Fluoridation - Staff Responses to Statements and Questions
(For information)

Presentation by Jessica Hopkins, Medical Officer of Health

5. COMMUNICATIONS

5.1. **Liesa Cianchino, Chair, Concerned Residents of Peel to End Fluoridation,** E-mail dated May 10, 2018, Regarding the Response Letter from the Ministry of Health and Long-Term Care (Receipt recommended)

6. IN CAMERA MATTERS

- 6.1. Community Water Fluoridation - Staff Responses to Legal Statements and Questions
(For information) (Advice that is subject to solicitor-client privilege)

7. OTHER BUSINESS

8. NEXT MEETING

To be determined.

9. ADJOURNMENT

Request for Delegation

FOR OFFICE USE ONLY

| | |
|---------------------------------------|----------------------|
| MEETING DATE YYYY/MM/DD 2018/07/05 | MEETING NAME CWFC |
|---------------------------------------|----------------------|

Attention: Regional Clerk
Regional Municipality of Peel
10 Peel Centre Drive, Suite A
Brampton, ON L6T 4B9
Phone: 905-791-7800 ext. 4582
E-mail: council@peelregion.ca

DATE SUBMITTED YYYY/MM/DD

NAME OF INDIVIDUAL(S)

Liesa Cianchino

POSITION(S)/TITLE(S)

Chair

NAME OF ORGANIZATION(S)

Concerned Residents of Peel to End Fluoridation

E-MAIL

TELEPHONE NUMBER

EXTENSION

REASON(S) FOR DELEGATION REQUEST (SUBJECT MATTER TO BE DISCUSSED)

Regarding Water Fluoridation in Peel

A formal presentation will accompany my delegation Yes No

Presentation format: PowerPoint File (.ppt) Adobe File or equivalent (.pdf)
 Picture File (.jpg) Video File (.avi,.mpg) Other

Additional printed information/materials will be distributed with my delegation : Yes No Attached

Note:

Delegates are requested to provide an electronic copy of all background material / presentations to the Clerk's Division at least seven (7) business days prior to the meeting date so that it can be included with the agenda package. In accordance with Procedure By-law 9-2018 delegates appearing before Regional Council or Committee are requested to limit their remarks to 5 minutes and 10 minutes respectively (approximately 5/10 slides).

Delegates should make every effort to ensure their presentation material is prepared in an accessible format.

Once the above information is received in the Clerk's Division, you will be contacted by Legislative Services staff to confirm your placement on the appropriate agenda. Thank you.

Notice with Respect to the Collection of Personal Information
(Municipal Freedom of Information and Protection of Privacy Act)

Personal information contained on this form is authorized under Section 5.4 of the Region of Peel Procedure By-law 9-2018, for the purpose of contacting individuals and/or organizations requesting an opportunity to appear as a delegation before Regional Council or a Committee of Council. The Delegation Request Form will be published in its entirety with the public agenda. The Procedure By-law is a requirement of Section 238(2) of the *Municipal Act, 2001*, as amended. Please note that all meetings are open to the public except where permitted to be closed to the public under legislated authority. All Regional Council meetings are audio broadcast via the internet and will be posted and available for viewing subsequent to those meetings. Questions about collection may be directed to the Manager of Legislative Services, 10 Peel Centre Drive, Suite A, 5th floor, Brampton, ON L6T 4B9, (905) 791-7800 ext. 4462.

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E-mail: council@peelregion.ca

DATE SUBMITTED YYYY/MM/DD

NAME OF INDIVIDUAL(S)

Christine Massey

POSITION(S)/TITLE(S)

Spokesperson

NAME OF ORGANIZATION(S)

Fluoride Free Peel

E-MAIL

TELEPHONE NUMBER

EXTENSION

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Video File (.avi,.mpg)

Other

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**“Optimally” Fluoridated Water
Delivers Contraindicated Doses
Every Single Day
to the Most Vulnerable**

**(Fetuses, Infants and Young Children, Especially in
Low Income Families
that Cannot Afford Unfluoridated Water)**

**Christine Massey, M.Sc.
Fluoride Free Peel
July 5th, 2018**

Handout available at:

www.fluoridefreepeel.ca/ffp-delegations-to-peel-council/

Health Canada on Fluoride

*“Health Canada does **not** consider fluoride as an essential nutrient.”*

http://www.oag-bvg.gc.ca/internet/English/pet_221_e_30308.html

*“Fluoride supplements... **Only** take them if an oral health professional advises you to.”*

<https://www.canada.ca/en/health-canada/services/healthy-living/your-health/environment/fluorides-human-health.html#s3>

The fluoride doses received by children from drinking fluoridated water are similar to doses in oral supplements

http://www.oag-bvg.gc.ca/internet/English/pet_299C_e_35212.html

Health Canada on Fluoride

*“The action of fluoride is **topical**.”*

*“**No fluoride** should be given before the teeth have erupted.”*

*“Supplemental fluoride should be given **only after 6 months of age and only in the following conditions...**”*

*“Supplemental fluoride should be in mouthwash, lozenges or drops diluted in water and **sprayed on the teeth**.”*

<https://www.canada.ca/en/health-canada/services/first-nations-inuit-health/health-care-services/nursing/clinical-practice-guidelines-nurses-primary-care/pediatric-adolescent-care/chapter-7-nutrition.html>

Health Canada on Fluoride

*Young children tend to swallow toothpaste → **increased risk of dental fluorosis***

*Up to 3 years of age: brush with **rice sized grain** of fluoride toothpaste twice per day **only if** the child is at risk of developing cavities; if not at risk brush with water*

*3 - 6 years: help children brush their teeth with a **pea-sized bit** of fluoride toothpaste*

<http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/environ/fluor-eng.php>

Health Canada on Fluoride

*Toothpastes with fluoride are **drugs** since fluoride prevents caries; toothpastes without fluoride are cosmetics...*

<https://www.canada.ca/en/health-canada/services/consumer-product-safety/reports-publications/industry-professionals/labelling-cosmetics.html>

Required warning on fluoride toothpaste:

“Keep out of reach of children under 6 years of age. If a quantity greater than the dose used for brushing is accidentally swallowed, get medical help or contact a Poison Control Centre right away (FDA 1995).”

<http://webprod.hc-sc.gc.ca/nhpid-bdipsn/atReq.do?atid=oral.health.sante.bucco.dentaire>

CDC on Children's Fluoride Exposure from Toothpaste

*Children <6 years & especially <2 years have poor control of swallowing reflex → **increased risk for dental fluorosis***

*So use **only a pea-sized bit of toothpaste***

*Supervise them and **have them spit it out***

One gram of toothpaste has approx. 1 mg of fluoride

A pea-sized bit of toothpaste is approx. 0.25 g toothpaste (and therefore contains approx. 0.25 mg fluoride)

Health Canada on Dental Fluorosis: Caused by Fluoride Overexposure

“a permanent hypomineralization of tooth enamel due to fluoride-induced disruption of tooth development... in people with high exposure... occurs only when exposure to fluorides happens during tooth formation”



- Guidelines for Canadian Drinking Water Quality Technical Document Fluoride, 2010:
<https://www.canada.ca/en/health-canada/services/publicatigns/healthy-living/guidelines-canadian-drinking-water-quality-guideline-technical-dgdocument-fluoride/page-3-guidelines-canadian-drinking-water-quality-guideline-technical-dgdocument-fluoride.html#a101>

Public Health attitude: “Not an adverse effect”;
publish fraudulent, misleading reports that hide actual prevalence

FDA & Health Canada Require Warnings on Fluoride Toothpaste

Colgate[®] **CAVITY PROTECTION**
Great Regular Flavor

NET WT 1.5 OZ (42 g) •PROVEN CAVITY FIGHTING FLUORIDE TOOTHPASTE•

USE: Helps protect against cavities.

DIRECTIONS: Brush thoroughly at least twice a day (best if after meals) or as directed by a dentist or physician. Children 2 to 6 years: Use only a pea sized amount and supervise child's brushing and rinsing (to minimize swallowing). Under 2 years: Ask your dentist or physician.

WARNING: Keep out of the reach of children under 6 years of age. In case of accidental ingestion, seek professional assistance or contact a Poison Control Center immediately.

ACTIVE INGREDIENT: SODIUM MONOFLUOROPHOSPHATE
(0.15% W/V FLUORIDE ION)

OTHER INGREDIENTS: DICALCIUM PHOSPHATE DIHYDRATE, WATER, GLYCERIN AND/OR SORBITOL, SODIUM LAURYL SULFATE, CELLULOSE GUM, FLAVOR, TETRASODIUM PYROPHOSPHATE, SODIUM SACCHARIN.

Questions? Comments?
Please call toll-free 1-800-688-6502.

Visit Colgate's World of

OPEN OTHER END

Canadian Dental Association

*“... use of fluoridated toothpaste in this age group is determined by the level of risk. Parents should consult a health professional to determine whether a **child up to 3 years of age** is at risk of developing tooth decay. **If such a risk exists, the child’s teeth should be brushed by an adult using a minimal amount (a portion the size of a grain of rice...)** of fluoridated toothpaste.*

***Children from 3 to 6 years of age should be assisted by an adult in brushing their teeth. Only a small amount (a portion the size of a green pea...)** of fluoridated toothpaste should be used.”*

Problem: Our Fluoridated Water

Peel's fluoridated water has 0.65 mg fluoride per litre (0.65 ppm)

Each 385 ml, or 0.385 litre, of our water contains:

$0.385 \text{ L} \times 0.65 \text{ mg/L} = \mathbf{0.25 \text{ mg fluoride}}$

the same dose found in a pea-sized bit of toothpaste

Does this make sense to you?

| | | |
|---|---|---|
|  | = |  |
| Pea-sized dab of toothpaste | | One glass of 0.7ppm water |
| 0.25mg of fluoride | | 0.25mg of fluoride |
| Monitor children! Make sure they SPIT IT OUT! | | No Risk, SWALLOW REPEATEDLY! |

With No Warnings Provided to the Public

For Information

DATE: June 26, 2018

REPORT TITLE: **COMMUNITY WATER FLUORIDATION – STAFF RESPONSES TO STATEMENTS AND QUESTIONS**

FROM: Nancy Polsinelli, Commissioner of Health Services
Jessica Hopkins, MD MHScc CCFP FRCPC, Medical Officer of Health

OBJECTIVE

The objective of this report is to address the statements and questions directed to staff by the Community Water Fluoridation Committee (CWFC) at the CWFC meeting held on April 19, 2018.

REPORT HIGHLIGHTS

- The CWFC was suspended on March 9, 2017 as per resolution 2017-185, and reconvened on April 6, 2018.
- Currently, 71 per cent of Ontarians have access to a fluoridated water system.
- Evidence supports that community water fluoridation is a safe and effective intervention to prevent tooth decay.
- Evidence does not support a link between fluoride in drinking water at the optimal concentration range of 0.5 - 0.8mg/L and any adverse health effects.
- The water treatment additive, hydrofluorosilicic acid (HFSA), used in Peel completely dissociates when added to water, so that only the fluoride ion remains in the drinking water, not HFSA. As a result, safe drinking water guidelines are based on conducting long-term toxicological studies for substances that are ingested with water, not added to water (i.e., fluoride, not HFSA).
- The classification of fluoride depends upon its purpose and use. As community water fluoridation is practiced in Peel, it is classified by the National Sanitation Foundation (NSF International) as a direct additive or a drinking water treatment chemical. It is not classified as a medication.
- The responsibility for providing safe drinking water and community water fluoridation is shared between the federal, provincial/territorial, and municipal governments.
- Community water fluoridation is supported by governments and health organizations worldwide as an effective public health intervention to prevent tooth decay.
- Community water fluoridation is recognized as an important part of a comprehensive oral health approach for improving overall health and well-being.

COMMUNITY WATER FLUORIDATION - STAFF RESPONSES TO STATEMENTS AND QUESTIONS

DISCUSSION

1. Background

Public Health continually monitors and reviews scientific evidence related to community water fluoridation. Based upon high-quality scientific evidence that is applicable to community water fluoridation in Peel (i.e., at the optimal range of 0.5 – 0.8 mg/L), Public Health continues to support community water fluoridation as safe and effective. The Region of Peel uses a fluoride additive derived from calcium fluoride at a target concentration of 0.65 mg/L.

This report responds to direction from the CWFC to respond to five questions and verify 20 statements related to community water fluoridation.

2. Responses

Much of the information included in this report has been previously provided to the CWFC. Staff have categorized the statements and questions into common themes including: Legislative authority, community water fluoridation in Ontario and Canada, classification of fluoride, effectiveness of community water fluoridation, safety of community water fluoridation and testing. Summarized responses are provided in this report. Responses to each statement and question are provided in Appendix I.

a) Legislative Authority

The report on the Legislative Framework for the Authorization and Regulation of Community Water Fluoridation presented to CWFC on June 9, 2016 provided an overview of the legislative framework that regulates the practice of community water fluoridation in the Province of Ontario. The responsibility for providing safe drinking water and community water fluoridation is shared between the federal, provincial/territorial, and municipal governments. There is no direct federal regulation of community water fluoridation. Health Canada plays a major role in providing the scientific and technical basis for the drinking water standards that are implemented by the provinces and territories.

b) Community Water Fluoridation in Ontario and Canada

The Public Health Agency of Canada (PHAC) reports that 71 per cent of Ontarians and 39 per cent of Canadians have access to fluoridated water. Currently, there is no standardized reporting system for community water fluoridation in Canada which presents a limitation to data collection (e.g., timing, quality, completeness) and a challenge when comparing Ontario to other provinces and territories. Ontario has stringent standards for the regulation of community water fluoridation and is able to provide complete and quality data on community water fluoridation.

Despite the persuasive evidence on the safety and effectiveness of community water fluoridation and policy support, some Ontario municipalities have discontinued community water fluoridation. Local decisions to discontinue community water fluoridation vary by jurisdiction and may be influenced by factors such as technical and financial aspects, and community input. Among the municipalities in Ontario that have

COMMUNITY WATER FLUORIDATION - STAFF RESPONSES TO STATEMENTS AND QUESTIONS

discontinued water fluoridation, not one has decided to do so under the advice of their Medical Officer of Health, who are experts on issues such as the safety, efficacy and need for community water fluoridation. Health Canada and the Ministry of Health and Long-Term Care (MOHLTC) strongly encourage community water fluoridation, but recognize that there are many factors that municipalities must consider when deciding to fluoridate, including the size and sophistication of their water system, and the cost of installing and maintaining equipment.

Community water fluoridation is supported by many governments and health organizations, including the Public Health Agency of Canada, Health Canada, the Canadian Public Health Association, the Canadian Dental Association, the Canadian Medical Association and the World Health Organization.

c) Classification of Fluoride

Regardless of how fluoride is classified, community water fluoridation remains a safe and effective strategy to prevent tooth decay at the population level. Fluoride is an abundant, naturally occurring ion of the element fluorine. The classification of fluoride depends upon its purpose and use. As community water fluoridation is practiced in Peel, hydrofluorosilicic acid (HFSA) is classified by NSF International as a direct additive or a drinking water treatment chemical. It is not classified as a medication. The water treatment additive, HFSA, used in Peel completely dissociates when added to water, so that the fluoride ion is provided in the drinking water, not HFSA. As a result, safe drinking water guidelines are based on conducting long-term toxicological studies for substances that are ingested with water, not added to water (i.e., fluoride, not HFSA). See also the Memo from the Medical Officer of Health to the CWFC on February 2, 2017 for more information.

d) Effectiveness of Community Water Fluoridation

Community water fluoridation, as practiced in Peel, is an effective strategy to prevent tooth decay for all Peel residents. On October 13, 2016, the CWFC received a report on the Effectiveness and Safety of Community Water Fluoridation. Public Health used a systematic process to review high quality scientific evidence related to community water fluoridation. The highest quality evidence from a Cochrane systematic review concluded that community water fluoridation is effective at preventing tooth decay. Specifically, when comparing rates of tooth decay in fluoridated areas to those in low or non-fluoridated areas, evidence shows a 35 per cent reduction in cavities of baby teeth, 26 per cent reduction in cavities in permanent teeth and 15 per cent increase in children with no cavities. Since the October 13, 2016 report, Public Health has continued to monitor new evidence which affirms the effectiveness and safety of community water fluoridation at the optimal concentration range of 0.5 – 0.8 mg/L.

e) Safety of Community Water Fluoridation

Community water fluoridation, as practiced in Peel, is a safe strategy to prevent tooth decay for all Peel residents. The evidence presented in the report on the Effectiveness and Safety of Community Water Fluoridation (October 13, 2016) did not support a link between fluoride in drinking water at the optimal concentration range of 0.5 - 0.8mg/L and any adverse health effects, including cancer of all causes, thyroid cancer, bone

COMMUNITY WATER FLUORIDATION - STAFF RESPONSES TO STATEMENTS AND QUESTIONS

cancer/osteosarcoma, intelligence, congenital malformations, dementia, still births, Down syndrome, sudden infant death syndrome, mental retardation, skeletal fluorosis, bone fracture, hip fracture, osteoporosis, goitre, urinary stone disease, coronary heart disease/mortality, and all-cause mortality. Evidence does indicate that optimally fluoridated water may be associated with a small increased risk of dental fluorosis with only cosmetic impact.

Health Canada developed the Guidelines for Canadian Drinking Water Quality: Guideline Technical Document – Fluoride (“Guidelines”), which identifies the Maximum Acceptable Concentration for fluoride (1.5 mg/L). This *Guideline* relies on rigorous evaluation of high quality evidence examining the toxicological effects of fluoridated water. It reviewed over 430 studies, including chronic toxicological studies, to determine that the consumption of water fluoridated at the optimal level did not pose a risk to human health. The Guideline development also included a comprehensive peer-review process with international experts in relevant fields and approval by the Federal/Provincial/Territorial Committee on Drinking Water and the Federal/Provincial/Territorial Committee on Health and Environment.

In 2017, the United States Environmental Protection Agency issued a response to the Fluoride Action Network’s petition to “prohibit the purposeful addition of fluoridation chemicals to U.S. water supplies, as fluoride is a neurotoxin”. The Environmental Protection Agency denied the petition on the basis that the scientific evidence presented does not support the conclusion that any persons have suffered neurotoxic harm as a result of exposure to fluoridated water.

f) Testing

Under Ontario’s *Safe Drinking Water Act, 2002*, any chemical additives used by municipal drinking water treatment plants must meet all applicable standards set by the American Water Works Association and be tested and certified to National Sanitation Foundation/American National Standards Institute (NSF/ANSI) Standard 60: Drinking Water Treatment Chemicals – Health Effects. As part of the requirement for NSF Standard 60 certification, a toxicological review of the product is required to ensure safety at the maximum use level and to evaluate potential contaminants in the product. Under *Section A.3.2 Substance regulated by Health Canada* of NSF/ANSI 60, “where Health Canada has finalized a Maximum Allowable Concentration, no additional toxicological evaluation shall be required prior to performance of the risk estimation.” For the purposes of drinking water treatment chemicals, toxicology reviews are conducted for substances that are ingested with drinking water. Health Canada has not conducted toxicology reviews on HFSA because it completely dissociates, leaving fluoride in the water, not HFSA. No additional toxicological testing is required on HFSA to receive NSF Standard 60 certification because Health Canada has established the Maximum Allowable Concentration for fluoride. See also the Memo from the Medical Officer of Health to the CWFC on February 2, 2017 for more information.

The report on Fluoridation of Drinking Water in the Region of Peel presented to CWC on June 9, 2016 provided an overview of Peel’s current fluoridation practices for drinking water systems. Over the years, the process of fluoridation in the Region has been diligently monitored and carried out in accordance with the regulatory framework for water fluoridation in Canada and Ontario. The addition of fluoride to drinking water is

COMMUNITY WATER FLUORIDATION - STAFF RESPONSES TO STATEMENTS AND QUESTIONS

controlled through a computerized system, overseen by water operators and monitored 365 days per year. In addition, fluoride concentration is monitored and measured by continuous analyzers and sampled and tested manually twice daily.

CONCLUSION

Community water fluoridation is recognized as an important part of a comprehensive oral health approach for improving overall health and well-being. The use of fluoride for the prevention of tooth decay is endorsed by over 90 national and international governmental and professional health organizations. The Region of Peel's water, with the practice of community water fluoridation, meets all requirements under the legislation to be considered safe and high quality.



Nancy Polsinelli, Commissioner of Health Services



Jessica Hopkins, MD MHSc CCFP FRCPC, Medical Officer of Health

Approved for Submission:



D. Szwarc, Chief Administrative Officer

APPENDICES

Appendix I: Responses to Statements Directed to Staff at the April 19, 2018 Community Water Fluoridation Committee Meeting

For further information regarding this report, please contact: Paul Sharma, Director, Chronic Disease and Injury Prevention ext. 2013.

Authored By: Fatime Sadeq, Analyst, Research and Policy, Chronic Disease and Injury Prevention

Responses to Statements Directed to Staff at the April 19, 2018 Community Water Fluoridation Committee Meeting**A. RESPONSES TO QUESTIONS****1. *Why hasn't the Province or Health Canada legislated Water Fluoridation to all Canadians?***

Public Health cannot speak on behalf of the Province or Health Canada regarding the reasons for this policy approach. However, both Health Canada and Ontario's Ministry of Health and Long-Term Care ('Ministry') have publicly supported community water fluoridation.

Source:

MOHLTC Letter – March 23, 2018: Response to resolution 2017-68

Past Communications to Committee:

- CWFC Agenda – June 9, 2016 | 4.1 Report on the Legislative Framework for the Authorization and Regulation of Community Water Fluoridation

2. *Why has the responsibility to approve water fluoridation been given to Municipal Councillors when 70% of Canadians have rejected the practice?*

Public Health is unable to speak on behalf of the provincial or federal governments regarding this policy decision. The responsibility of providing safe drinking water and community water fluoridation is shared between the federal, provincial/territorial, and municipal governments.

Between 2012 and 2017, access to fluoridated water (through water systems) increased from 37.4% to 38.7%. Over the last five years in Ontario, fluoridated water systems coverage increased from 67% in 2012 to 71% in 2017.

Local decisions to discontinue community water fluoridation vary by jurisdiction and may be influenced by various factors such as the size and sophistication of their water system, the cost of installing and maintaining equipment and community input.

Health Canada and the Ontario Ministry of Health and Long-Term Care strongly encourage community water fluoridation but recognize that there are many factors municipalities must consider when deciding to fluoridate.

Source:

Public Health Agency of Canada, Public Health Capacity and Knowledge Management Unit, Quebec Region for the Office of the Chief Dental Officer of Canada [Internet]. The State of Community Water Fluoridation across Canada: 2017 Report. Ottawa: PHAC; 2017 [cited 2018 May 7]. Available from: <https://www.canada.ca/en/services/health/publications/healthy-living/community-water-fluoridation-across-canada-2017.html>

Responses to Statements Directed to Staff at the April 19, 2018 Community Water Fluoridation Committee Meeting**Past Communications to Committee:**

- CWFC Agenda – November 24, 2016 | 4.2 Updated Review of Evidence on the Effectiveness and Safety of Community Water Fluoridation
- CWFC Agenda – June 9, 2016 | 4.1 Report on the Legislative Framework for the Authorization and Regulation of Community Water Fluoridation

3. Why do Malton's children have much higher cavity rates than the rest of the Region's children?

Oral health is influenced by many factors, including individual behaviours, access to oral health care, and the social determinants of health. Oral health care is not publicly funded in Canada and may leave vulnerable populations with difficulty accessing dental care services. Even with government programs like Healthy Smiles Ontario, dental services are extremely underutilized, with a majority of services being paid out-of-pocket. Regardless of private dental insurance, access to care is not guaranteed.

Community level factors such as housing, education and income greatly influence health and contribute to inequity in oral health status. Nearly 16% of Malton's population is living in low income (2016 Census Profile, Ontario, Mississauga-Malton) and may be unable to afford appropriate dental care even with dental insurance (by comparison, the prevalence of low income in Peel is 10.1% and Ontario is 9.8% of the population). Malton community has a rich history of recent immigrants, with about 60% of the population being newcomers to Canada. A number of children, particularly recent immigrants, have their first encounter with a dental professional during oral health screening in elementary schools.

Public Health collects children's oral health data through dental screenings in all publicly-funded elementary schools. Malton school screening data in 2016/2017 showed that 64% of children in Malton's schools had a dental need. In comparison, 59% of children screened in Peel had a dental need. Identified dental needs include urgent conditions such as infection and decay that cause pain, non-urgent conditions such as early tooth decay and preventive dental needs such as cleanings, topical fluoride applications and dental sealants. A greater proportion of children screened in Malton had urgent dental needs (19%) compared to all children screened in Peel (13%). However, the non-urgent and preventive dental needs of children in Malton's schools are comparable to those in Peel.

Community water fluoridation is accessible to the entire community regardless of socioeconomic status, education, income or race/ethnicity. The preventative effects of fluoride are available to those who cannot afford other types of fluoride (i.e. toothpaste, mouth rinses and fluoride applied in dental offices). The combination of population, community and individual level services and programs are particularly important in helping to address oral health needs of vulnerable residents in Peel.

Source:

Public Health Agency of Canada. Position statement on Community Water Fluoridation [Internet]. Ottawa: PHAC; 2016 [cited 2018 May 7]. Available from: <https://www.canada.ca/en/services/health/publications/healthy-living/fluoride-position-statement.html>

See also: *2017 Oral Health in Peel: Key Findings about Risk Factors and Oral Health Outcomes - Table 1: Summary of Available Data Describing Biological, Behaviour Risk Factors and Protective Factors Associated with Oral Health Outcomes for Peel*. Region of Peel-Public Health.

Responses to Statements Directed to Staff at the April 19, 2018 Community Water Fluoridation Committee Meeting

4. Why did the Provincial Government fail to approve MPP Delaney's [sic] Private Members Bill to legislate water fluoridation in Ontario?

Context

On October 6, 2016, MPP Delaney proposed the following Private Members motion (no. 27) which was supported by all three parties and was passed:

“That, in the opinion of this House, the Province of Ontario, upon passage of this resolution, act to replace the outdated Fluoridation Act with an updated section of the Health Protection and Promotion Act, and remove the portions of the Ontario Municipal Act that allow a municipality to either opt out of fluoridation of its drinking water once the process has started, or to fail to start the fluoridation of municipal drinking water; and that the Province of Ontario work with municipalities to provide financial and technical assistance to Ontario cities and towns to begin water fluoridation, or to continue and upgrade fluoridation equipment and processes so that all Ontarians, to the fullest extent practicable, are protected with municipal drinking water fluoridation.”

Response

MPP Delaney did not propose a Private Members Bill. There was a private member's motion to state the opinion of the Legislature (MPP Delaney) suggesting the action the government should take on community water fluoridation.

The purpose of MPP Delaney's private member's motion was to state an opinion on what action the government should take. It did not have a binding effect or require the bill to be given more consideration.

Additional Information:

Excerpt from House of Commons Procedure and Practice, Parliament of Canada:

“Private Members' motions are used to introduce a wide range of issues and are framed either as resolutions or as orders, depending on their intent. Motions attempting to make a declaration of opinion or purpose, without ordering or requiring a particular course of action, are considered resolutions.

These are typically motions that suggest that the Government initiate a certain measure and are generally phrased as follows: “That, in the opinion of the House, the government should consider ...” The Government is not bound to adopt a specific policy or course of action as a result of the adoption of such a resolution since the House is only stating an opinion or making a declaration of purpose.

5. Who is responsible to do the Health Canada Toxicology reviews on HFSA to ensure it's safe for human consumption?

Health Canada has conducted a comprehensive health assessment and no additional toxicology reviews are required. In establishing the Maximum Acceptable Concentration of 1.5 mg/L for fluoride, Health Canada considered more than 400 studies, including chronic toxicology studies. Because HFSA, the product used to fluoridate Peel's tap water, is proven to completely and immediately disassociate when added to tap water, leaving only fluoride ions, silicates and trace residuals, **no additional toxicology testing is required on HFSA as it is not present in drinking water.**

COMMUNITY WATER FLUORIDATION – STAFF RESPONSES TO STATEMENTS AND QUESTIONS**Responses to Statements Directed to Staff at the April 19, 2018 Community Water Fluoridation Committee Meeting**

Under Ontario's Safe Drinking Water Act (SDWA), 2002, any chemical additives used by municipal drinking water treatment plants must meet all applicable standards set by the American Water Works Association (AWWA) and be tested and certified to National Sanitation Foundation/American National Standards Institute (NSF/ANSI) Standard 60: Drinking Water Treatment Chemicals – Health Effects.

As part of the requirement for NSF Standard 60 certification, a toxicological review of the product is required to ensure safety at the maximum use level and to evaluate potential contaminants in the product. Under Section A.3.2 Substance regulated by SUEPA or Health Canada of NSF/ANSI 60, "where Health Canada has finalized a Maximum Acceptable Concentration, no additional toxicological evaluation shall be required prior to performance of the risk estimation."

Sources:

Health Canada. Guidelines for Canadian Drinking Water Quality: Guideline Technical Document – Fluoride [Internet]. Ottawa: Health Canada; 2010 [cited 2018 May 7]. Available from: <https://www.canada.ca/content/dam/canada/health-canada/migration/healthy-canadians/publications/healthy-living-vie-saine/water-fluoride-fluorure-eau/alt/water-fluoride-fluorure-eau-eng.pdf>

NSF International. NSF/ANSI 60 -2016. Drinking Water Treatment Chemicals – Health Effects [Internet]. Michigan: NSF International [cited 2018 May 7]. Available from: http://www.nsf.org/newsroom_pdf/NSF_60-13_-_watermarked.pdf

Past Communications to Committee:

- CWFC Agenda – June 9, 2016 | 4.1 Report on the Legislative Framework for the Authorization and Regulation of Community Water Fluoridation
- CWFC Agenda – November 24, 2016 | 4.2 Updated Review of Evidence on the Effectiveness and Safety of Community Water Fluoridation
- CWFC Agenda – February 2, 2017 | 4.1 Addressing Committee Member Questions (Oral)

B. RESPONSES TO STATEMENTS**Statement 1:**

The Supreme Court of Canada ruled that Water Fluoridation is a Medication.

Response:

To be addressed by Legal Services in accompanying In Camera report.

Statement 2:

Health Canada classifies Water Fluoridation a Water Treatment Chemical.

Response:

The classification of HFSA depends upon its purpose and use. For the purpose of fluoridating the water supply, NSF International classifies HFSA as a direct additive or a drinking water treatment chemical. Health Canada recommends the use of drinking water treatment additives (including products used for fluoridation) that have been certified to NSF standards.

Source:

NSF International. NSF/ANSI 60 -2016. Drinking Water Treatment Chemicals – Health Effects [Internet]. Michigan: NSF International [cited 2018 May 7]. Available from: http://www.nsf.org/newsroom_pdf/NSF_60-13_-_watermarked.pdf

Responses to Statements Directed to Staff at the April 19, 2018 Community Water Fluoridation Committee Meeting**Statement 3:**

The Supreme Court Ruling that Water Fluoridation is a medication is still in effect.

Response:

To be addressed by Legal Services in accompanying In Camera report.

Statement 4:

The Minister of Health and Long-Term Care states that tooth decay is a disease.

Response:

The provincial government of Ontario has stated that tooth decay is a chronic disease.

“Dental caries, also known as tooth decay or cavities, is one of the most prevalent chronic diseases in humans. It is a disease in which the mineralized tissues of the tooth undergo progressive destruction from the surface of the tooth. Dental caries are caused by bacteria that colonize the tooth surface and produce sufficient acids to demineralize the enamel covering of the tooth crown or the cementum covering the root, and then the underlying dentin.”

Source:

Ministry of Health and Long-Term Care. Oral Health – More than Just Cavities. A Report by Ontario's Chief Medical Officer of Health [Internet]. Toronto: MOHLTC; 2012 [cited 2018 May 7]. Available from: http://www.health.gov.on.ca/en/common/ministry/publications/reports/oral_health/oral_health.pdf

Statement 5:

The Minister of Health and Long-Term Care states that water fluoridation prevents tooth decay

Response:

The provincial government of Ontario has stated that water fluoridation prevents tooth decay. The Ministry of Health and Long-Term Care urges municipalities to maintain the practice of adding fluoride to their drinking water to continue to protect their communities from avoidable health concerns.

The 2012 report produced by Ontario's Chief Medical Officer of Health titled *Oral Health – More Than Just Cavities* states that “Water fluoridation is the process of adjusting the level of fluoride in a public drinking water supply to optimize the dental benefits of preventing tooth decay.”

Sources:

MOHLTC Letter – March 23, 2018: Response to resolution 2017-68

Ministry of Health and Long-Term Care. Oral Health – More than Just Cavities. A Report by Ontario's Chief Medical Officer of Health [Internet]. Toronto: MOHLTC; 2012 [cited 2018 May 7]. Available from: http://www.health.gov.on.ca/en/common/ministry/publications/reports/oral_health/oral_health.pdf

Statement 6:

Section 7 of the Charter of Rights and Freedoms protect Canadians from forced medication.

Response:

To be addressed by Legal Services in accompanying In Camera report.

Responses to Statements Directed to Staff at the April 19, 2018 Community Water Fluoridation Committee Meeting**Statement 7:**

The CDC states that fluoride is mainly effective in reducing cavities when applied topically.

Response:

Staff were unable to locate a statement by the CDC related to Statement 7 provided by the Committee.

The CDC recognizes that drinking fluoridated water benefits both children and adults throughout their lives. For children, fluoride helps strengthen the adult (permanent) teeth still developing under the gums. While for adults, fluoridated water supports strong enamel and help teeth stay healthy, free from decay. The CDC states that **“Drinking fluoridated water keeps teeth strong and reduces cavities (also called tooth decay) by about 25% in children and adults.”**

Source:

Centers for Disease Control and Prevention, Division of Oral Health, National Center for Chronic Disease Prevention and Health Promotion. Community Water Fluoridation [Internet]. Atlanta: CDC; 2016 [cited 2018 May 7]. Available from: <https://www.cdc.gov/fluoridation/index.html>

Past Communications to Council:

- CWFC Agenda – April 14, 2016 | 4.2 .2 Mechanisms of Action of Fluoride (Oral)

Statement 8:

Dr. Cooney admitted that water fluoridation prevents less than ½ cavity per person per lifetime

Response:

Staff were unable to locate an official statement or transcript to verify this statement.

Dr. Cooney retired from the federal government in January 2015. Dr. Cooney was the Chief Dental Officer for the Public Health Agency of Canada and promoted the use of water fluoridation on many occasions. Dr. James Taylor is currently in this role and supports community water fluoridation as a safe, cost-effective and equitable public health practice for oral health and overall well-being.

In 2016, Peel Public Health conducted an updated review of the evidence where CWF is practiced within the optimal concentration range (0.5 – 0.8 mg/L). The evidence review was presented to the Community Water Fluoridation Committee on November 24, 2016.

Two systematic reviews of 50 studies combined and six single studies reported on the effectiveness of CWF, and all showed significant reductions in rates and severity of tooth decay in children and adults. The evidence from the most recent and strongest quality systematic review (Iheozor-Ejiofor et al., 2015) compared children living in fluoridated to low/non-fluoridated (<0.4 ppm) areas and found:

- 35% reduction in cavities in baby teeth (pooling of nine studies = 44,268 children)
- 26% reduction in cavities in permanent teeth (pooling of 10 studies = 78,764 children)
- 15% increase in children with no cavities (pooling of 18 studies = 93,504 children)

Responses to Statements Directed to Staff at the April 19, 2018 Community Water Fluoridation Committee Meeting

Sources:

Iheozor-Ejiofor Z, Worthington HV, Walsh T, O'Malley L, Clarkson JE, Macey R, Alam R, Tugwell P, Welch V, Glenny A (2015). Water fluoridation for the prevention of dental caries (review). Cochrane Database of Systematic Reviews, Issue 6. Art. No.: CD010856.

Public Health Agency of Canada. Position statement on Community Water Fluoridation [Internet]. Ottawa: PHAC; 2016 [cited 2018 May 7]. Available from: <https://www.canada.ca/en/services/health/publications/healthy-living/fluoride-position-statement.html>

Past Communications to Council:

- CWFC Agenda – November 24, 2016 | 4.2 Updated Review of Evidence on the Effectiveness and Safety of Community Water Fluoridation

Statement 9:

The W.H.O. reports that cavity rates in unfluoridated counties are similar to fluoridated countries.

Response:

WHO country-level data does not allow for direct comparison of cavity rates comparing countries. There are several methodological challenges due to confounders (i.e. comparing apples and oranges) in comparing cavity rates between unfluoridated countries and fluoridated countries. These confounding factors include socio-economic status, access to care, and age profile, which may impact oral health.

Countries that do not fluoridate their water may be undertaking another type of oral health program to improve the oral health of the population level (such as providing universal dental benefits). They may also be using other mechanisms to reduce tooth decay, including the fluoridation of salt or millet. Nearly 200 million people worldwide (in Europe, Central and South America and the Caribbean) consume fluoridated salt.

There are a number of countries that do not fluoridate their water supplies; however, failure to fluoridate should not be misconstrued as concern over safety or effectiveness. Some countries have not implemented a fluoridation system for a variety of technical, financial or political reasons. In many parts of the world, fluoridation is not feasible due to a lack of a central water supply, the presence of more urgent health needs, the lack of sufficient funds for start-up and maintenance costs, or the presence of naturally occurring fluoride levels sufficient to support the prevention of dental decay.

Globally, approximately 400 million people in over 60 countries benefit from adjusted or natural water fluoridation. Countries exercising community fluoridation in addition to Canada include the United Kingdom, Chile, South Korea, Singapore, Spain, Ireland, Israel, the United States, Brazil, Malaysia, Vietnam, Australia, New Zealand, Hong Kong, among many others.

Past Communications to Committee:

- CWFC Agenda – April 14, 2016 | 4.1 History of Community Water Fluoridation and World Health Organization (WHO) Oral Health Data (Oral)

Responses to Statements Directed to Staff at the April 19, 2018 Community Water Fluoridation Committee Meeting**Statement 10:**

Health Canada and the Provincial Minister of Health promote water fluoridation to be safe and effective.

Response:

Health Canada and the Ministry of Health and Long-Term Care support community water fluoridation as an effective way to prevent tooth decay. According to Health Canada, water fluoridation has been proven to be a safe, effective and equitable way to prevent and reduce tooth decay (including root decay) for people of all ages - from children to seniors. Health Canada recommends the use of drinking water treatment additives (including products used for fluoridation) that have been certified as meeting the appropriate NSF standard. These standards have been designed to safeguard drinking water by helping to ensure the material safety and performance of products that come into contact with drinking water.

The Ministry urges all municipalities to continue to protect their communities from avoidable health issues by maintaining fluoride in their drinking water, to promote the health of all residents.

Past Communications to Committee:

- CWFC Agenda – June 9, 2016 | 4.1 Report on the Legislative Framework for the Authorization and Regulation of Community Water Fluoridation
- CWFC Agenda – November 24, 2016 | 4.2 Updated Review of Evidence on the Effectiveness and Safety of Community Water Fluoridation

Statement 11:

70% of Canadian towns and cities have discontinued water fluoridation.

Response:

71% of Canadians do not have access to systematically fluoridated water but the reasons why vary. Community water fluoridation coverage for Canada has not changed significantly over the last ten years: 2007 (42.6%), 2012 (37.4%) and 2017 (38.7%).

Local decisions to start or stop community water fluoridation are influenced by various factors such as technical/operational feasibility, financial considerations and resident/ community input.¹⁵ Communities such as Montreal, QC, and Vancouver, BC have never fluoridated their water with ongoing public debate about beginning water fluoridation since the 1970's.

Of the municipalities in Ontario that have discontinued water fluoridation, not one has chosen to do so under the advice of their Medical Officer of Health who are widely considered experts on issues such as the safety, efficacy and need for community water fluoridation.

The Ministry of Health and Long-Term Care strongly encourages community water fluoridation but recognize that there are many factors municipalities must consider when deciding to fluoridate, including the size and sophistication of their water system, and the cost of installing and maintaining equipment.

Source:

Public Health Agency of Canada, Public Health Capacity and Knowledge Management Unit, Quebec Region for the Office of the Chief Dental Officer of Canada, [Internet]. Ottawa: PHAC; 2017 [cited 2018 May 7]. Available from: <https://www.canada.ca/en/services/health/publications/healthy-living/community-water-fluoridation-across-canada-2017.html>

Responses to Statements Directed to Staff at the April 19, 2018 Community Water Fluoridation Committee Meeting**Past Communications to Committee:**

- CWFC Agenda – November 24, 2016 | 4.2 Updated Review of Evidence on the Effectiveness and Safety of Community Water Fluoridation

Statement 12:

Fluoride, classified as a Neuro Toxin by the US EPA, is similar in toxicity to lead and arsenic.

Response:

Fluoride is not a neurotoxin (i.e. it does not have any demonstrated neurological effect at the concentration (i.e., 0.5 – 0.8 mg/L) used for community water fluoridation and is not similar in toxicity to lead and arsenic. Community water fluoridation ensures that fluoride is provided at a concentration well below the Maximum Acceptable Concentration that is determined safe even when other sources of fluoride are considered.

1. Fluoride is not a neurotoxin

The petition reviewed by the US EPA “...has not set forth a scientifically defensible basis to conclude that any persons have suffered neurotoxic harm as a result of exposure to fluoride in the U.S. through the purposeful addition of fluoridation chemicals to drinking water or otherwise from fluoride exposure in the U.S.”

“EPA and other authoritative bodies have previously reviewed many of the studies cited as evidence of neurotoxic effects of fluoride in humans and found significant limitations in using them to draw conclusions on whether neurotoxicity is associated with fluoridation of drinking water. In contrast, the benefits of community water fluoridation have been demonstrated to reduce dental caries, which is one of the most common childhood diseases and continues to be problematic in all age groups. Left untreated, decay can cause pain, school absences, difficulty concentrating, and poor appearance, all contributing to decreased quality of life and ability to succeed.”

Source:

EPA Reasons for Agency Response to Fluoride Chemicals in Drinking Water – February 27, 2017

2. Fluoride is not similar in toxicity to lead and arsenic

Health Canada establishes maximum levels for contaminants in food, water and air. In the context of Canadian drinking water, Health Canada has set a Maximum Acceptable Concentration (‘guideline’) for fluoride, lead, mercury, arsenic and many other chemicals. Each guideline was established based on current, published scientific research related to health effects, aesthetic effects, and operational considerations. Health-based guidelines are established on the basis of comprehensive reviews of the known health effects associated with each contaminant, on exposure levels and on the availability of treatment and analytical data.

Fluoride is not similar in toxicity to lead and arsenic. Health Canada sets a Maximum Acceptable Concentration of .010 mg/L for lead and 0.025 mg/L for arsenic, in drinking water (Ontario Regulation 169/03) both of which are significantly lower than fluoride (1.5 mg/L).

COMMUNITY WATER FLUORIDATION – STAFF RESPONSES TO STATEMENTS AND QUESTIONS

Responses to Statements Directed to Staff at the April 19, 2018 Community Water Fluoridation Committee Meeting

Additional Information:

- The lead and arsenic residuals sometimes found in HFSA are routinely tested for in the Region's treated drinking water supply and found to consistently measure at concentrations below the legislated Maximum Acceptable Concentrations, 0.010 mg/L for lead and 0.025 mg/L for arsenic, in drinking water (Ontario Regulation 169/03).
- The chart below reflects information comparing Peel levels of fluoride, arsenic and lead to municipalities who use the HFSA from calcium additive. Demonstrates there isn't a significant difference in trace elements levels in the water supply by fluoride additive type.

Table: Region of Peel, City of Toronto and Durham Region Fluoride, Arsenic and Lead Ranges in Drinking Water (2015 Drinking Water System Annual Reports)

| | Region of Peel | | City of Toronto | | | | Durham Region | | |
|--------------------------------|-------------------|-------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------|-----------------|-------------|
| | Lakeview | Lorne Park | R.C. Harris | Island | R.L. Clark | F.J. Horgan | Oshawa | Whitby | Ajax |
| Fluoride Residual Range (mg/L) | 0.20 – 1.02 | 0.20 – 0.88 | 0.38 – 0.71 | 0.52 – 0.72 | 0.41 – 0.65 | 0.40 – 0.68 | 0.20 – 1.10 | 0.20 – 1.31 | 0.19 – 1.02 |
| Mean Fluoride Residual (mg/L) | 0.64 | 0.65 | | | | | | | |
| Arsenic Range (mg/L) | < 0.001 | < 0.001 | 0.0007 – 0.0010 | 0.0011 – 0.0011 | 0.0008 – 0.0011 | 0.0011 – 0.0013 | ND – 0.0008 | ND – 0.0009 | ND – 0.0009 |
| Lead Range (mg/L) | < 0.0005 – 0.0059 | < 0.0005 – 0.0059 | 0 – 0 (< Detection Limit) | 0 – 0 (< Detection Limit) | 0 – 0 (< Detection Limit) | 0 – 0 (< Detection Limit) | 0 – 0.0003 | 0.0001 – 0.0221 | ND – 0.0056 |

Past Communications to Committee:

- CWFC Agenda – June 9, 2016 | 4.1 Report on the Legislative Framework for the Authorization and Regulation of Community Water Fluoridation
- CWFC Agenda – June 9, 2016 | 4.2 Fluoridation of Drinking Water in the Region of Peel

Statement 13:

Health Canada has the authority to legislate water fluoridation to all Canadians

Response:

To be addressed by Legal Services in accompanying In Camera report.

Statement 14:

The Province of Ontario has the authority to legislate water fluoridation for all Ontarians.

Response:

To be addressed by Legal Services in accompanying In Camera report.

Statement 15:

Toxicology reviews are recommended by Health Canada to ensure the safety of the fluoridation products.

COMMUNITY WATER FLUORIDATION – STAFF RESPONSES TO STATEMENTS AND QUESTIONS

Responses to Statements Directed to Staff at the April 19, 2018 Community Water Fluoridation Committee Meeting**Response:**

Health Canada does not require toxicological reviews to be conducted on fluoridation additives such as HFSA. HFSA completely dissociates when added to water, so that fluoride is provided in the drinking water, not HFSA. Health Canada conducted a comprehensive health risk assessment of fluoride in drinking water.

As per the February 2, 2017 memo, *Reponses to motion and inquires received from Committee or Regional Council*, provided to the Community Water Fluoridation Committee:

Health Canada oversees drinking water quality and works with the provincial and territorial governments to review, maintain and periodically revise the *Guidelines for Canadian Drinking Water Quality*. Health Canada developed the *Guidelines for Canadian Drinking Water Quality: Guideline Technical Document – Fluoride*, “the Maximum Acceptable Concentration for fluoride (1.5 mg/L using a rigorous scientific process which involves a review of the research on health effects and exposure that assess dose and potential adverse impact(s), examining relevant toxicological and epidemiological studies. This also includes a comprehensive peer-review process with international experts in relevant fields and approval by the Federal/Provincial/Territorial (FPT) Committee on Drinking Water and the FPT Committee on Health and Environment.

Health Canada recommends that drinking water treatment additives such as fluoridation agents be certified to the appropriate standard, specifically NSF/ANSI Standard 60: Drinking Water Treatment Chemicals - Health Effects. This standard requires a toxicology review of the product to ensure its safety at the maximum use level and to evaluate potential contaminants in the product.”

Source:

Cited from June 26, 2014 (Item 13.1) Source Letter to the Region of Peel from Minister of Health dated April 4, 2012

Additional Information:

Under the conditions (i.e., neutral pH) of municipal water, HFSA achieves complete dissociation and ionic disassociation when added to water. Upon contact with water, HFSA immediately breaks up into silicon, hydrogen and fluoride ions, with no HFSA remaining at the end of the treatment process in the water leaving the treatment plant. Finney, et al. conclusively demonstrated the complete hydrolysis of fluorosilicate in drinking water in his 2006 paper Re-examination of hexafluorosilicate hydrolysis by ¹⁹F NMR and pH measurement.

Source:

Finney, W.F., Wilson, E., Callender, A., Morris, M.D., & Beck, L.W. (2006). Re-examination of hexafluorosilicate hydrolysis by ¹⁹F NMR and pH measurement. *Environmental Science & Technology*, 40(8), 2572-2577.

Past Communications to Committee:

- CWFC Agenda – February 2, 2017 | 7.1 Motion From Councillor Sprovieri

Statement 16:

Toxicology studies are required on Fluoridation products to obtain NSF Standard 60 certification.

Response:

NSF Standard 60 certification requires that toxicological studies are done for water treatment

Responses to Statements Directed to Staff at the April 19, 2018 Community Water Fluoridation Committee Meeting

additives with the following caveat under Section A.3.2: *Data requirements for published risk assessments – Substance regulated by USEPA or Health Canada of NSF/ANSI 60,*

“where Health Canada has finalized a Maximum Acceptable Concentration, no additional toxicological evaluation shall be required prior to performance of the risk estimation.”

As mentioned previously, complete dissociation of HFSA is achieved when added to water. As a result, drinking water is a source of fluoride, not a source of HFSA. Health Canada conducted a comprehensive health risk assessment of fluoride in drinking water, including the examination of chronic toxicological studies on fluoride, to establish a MAC concentration of 1.5 mg/L/

Source:

NSF International. NSF/ANSI 60 -2016. Drinking Water Treatment Chemicals – Health Effects [Internet].

Michigan: NSF International [cited 2018 May 7]. Available from: http://www.nsf.org/newsroom_pdf/NSF_60-13_-_watermarked.pdf

Statement 17:

Health Canada required toxicology reviews on HFSA have not been done.

Response:

Health Canada does not require toxicological reviews to be conducted on fluoridation products. HFSA completely dissociates when added to water, so that fluoride is provided in the drinking water, not HFSA. Health Canada conducted a comprehensive health risk assessment of fluoride in drinking water.

As per the February 2, 2017 memo, *Reponses to motion and inquires received from Committee or Regional Council*, provided to the Community Water Fluoridation Committee:

Health Canada oversees drinking water quality and works with the provincial and territorial governments to review, maintain and periodically revise the *Guidelines for Canadian Drinking Water Quality*. Health Canada developed the *Guidelines for Canadian Drinking Water Quality: Guideline Technical Document – Fluoride*, “the Maximum Acceptable Concentration for fluoride (1.5 mg/L using a rigorous scientific process which involves a review of the research on health effects and exposure that assess dose and potential adverse impact(s), examining relevant toxicological and epidemiological studies. This also includes a comprehensive peer-review process with international experts in relevant fields and approval by the Federal/Provincial/Territorial (FPT) Committee on Drinking Water and the FPT Committee on Health and Environment.

Health Canada recommends that drinking water treatment additives such as fluoridation agents be certified to the appropriate standard, specifically NSF/ANSI Standard 60: Drinking Water Treatment Chemicals - Health Effects. This standard requires a toxicology review of the product to ensure its safety at the maximum use level and to evaluate potential contaminants in the product.”

Source:

Cited from June 26, 2014 (Item 13.1) Source Letter to the Region of Peel from Minister of Health dated April 4, 2012

Additional Information:

Under the conditions (i.e., neutral pH) of municipal water, HFSA achieves complete dissociation and ionic disassociation when added to water. Upon contact with water, HFSA immediately

Responses to Statements Directed to Staff at the April 19, 2018 Community Water Fluoridation Committee Meeting

breaks up into silicon, hydrogen and fluoride ions, with no HFSA remaining at the end of the treatment process in the water leaving the treatment plant. Finney, et al. conclusively demonstrated the complete hydrolysis of fluorosilicate in drinking water in his 2006 paper Re-examination of hexafluorosilicate hydrolysis by ¹⁹F NMR and pH measurement.

Source:

Finney, W.F., Wilson, E., Callender, A., Morris, M.D., & Beck, L.W. (2006). Re-examination of hexafluorosilicate hydrolysis by ¹⁹F NMR and pH measurement. *Environmental Science & Technology*, 40(8), 2572-2577.

Past Communications to Committee:

- CWFC Agenda – November 24, 2016 | 4.2 Updated Review of Evidence on the Effectiveness and Safety of Community Water Fluoridation
- CWFC Agenda – February 2, 2017 | 4.1 Addressing Committee Member Questions (Oral)

In response to the Committee's interest regarding toxicology studies, Dr. de Villa noted that Health Canada had set the optimal level of fluoride in drinking water based on the review of over 430 studies which include toxicological studies and that the studies show that at the optimal level, fluoride did not pose a risk to human health. In respect to the additive hydrofluorosilic acid (HFSA), Dr. de Villa stated that HFSA dissociates when mixed with drinking water, which means that the fluoride ion, silicates (sand) and hydrogen separate from one another. In other words, when the water leaves the treatment plant and is consumed, there is no HFSA present. Therefore, toxicology studies on HFSA are not required.

Statement 18:

The FDA has never approved fluoride supplements as safe and effective in preventing tooth decay.

Response:

From the FDA website (search date May 3, 2018):

“The 1974 Safe Drinking Water Act gave regulatory oversight of public drinking water (tap water) to the U.S. Environmental Protection Agency (EPA). FDA has responsibility for ensuring that the quality standards for bottled water are compatible with EPA standards for tap water. According to the EPA, fluoride is voluntarily added to some drinking water systems as a public health measure to help reduce the incidence of cavities among the population. The decision to fluoridate a water supply is made by the State or local municipality, and is not mandated by EPA or any other Federal entity.”

Statement 19:

Harmful chemicals that make up fluoridation products [HFSA] accumulate in our bodies.

Response:

HFSA is proven to completely and immediately disassociate when added to tap water, leaving no HFSA in the tap water, only fluoride ions, silicates (sand) and trace residuals. After this, HFSA no longer exists in the water and therefore, drinking water is a source of fluoride but not a source of HFSA.

COMMUNITY WATER FLUORIDATION – STAFF RESPONSES TO STATEMENTS AND QUESTIONS

Responses to Statements Directed to Staff at the April 19, 2018 Community Water Fluoridation Committee Meeting

Health Canada conducted a comprehensive health risk assessment of fluoride in drinking water, including the examination of chronic toxicological studies on fluoride, to establish a MAC concentration of 1.5 mg/L which takes into consideration fluoride from other sources.

Additional Information:

- The lead and arsenic residuals sometimes found in HFSA are routinely tested for in the Region's treated drinking water supply and found to consistently measure at concentrations below the legislated maximum acceptable concentrations, 0.010 mg/L for lead and 0.025 mg/L for arsenic, in drinking water (Ontario Regulation 169/03).
- The chart below reflects information comparing Peel levels of fluoride, arsenic and lead to municipalities who use the HFSA from calcium additive. Demonstrates there isn't a significant difference in trace elements levels in the water supply by fluoride additive type.

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| | Lakeview | Lorne Park | R.C. Harris | Island | R.L. Clark | F.J. Horgan | Oshawa | Whitby | Ajax |
| Fluoride Residual Range (mg/L) | 0.20 – 1.02 | 0.20 – 0.88 | 0.38 – 0.71 | 0.52 – 0.72 | 0.41 – 0.65 | 0.40 – 0.68 | 0.20 – 1.10 | 0.20 – 1.31 | 0.19 – 1.02 |
| Mean Fluoride Residual (mg/L) | 0.64 | 0.65 | | | | | | | |
| Arsenic Range (mg/L) | < 0.001 | < 0.001 | 0.0007 – 0.0010 | 0.0011 – 0.0011 | 0.0008 – 0.0011 | 0.0011 – 0.0013 | ND – 0.0008 | ND – 0.0009 | ND – 0.0009 |
| Lead Range (mg/L) | < 0.0005 – 0.0059 | < 0.0005 – 0.0059 | 0 – 0 (< Detection Limit) | 0 – 0 (< Detection Limit) | 0 – 0 (< Detection Limit) | 0 – 0 (< Detection Limit) | 0 – 0.0003 | 0.0001 – 0.0221 | ND – 0.0056 |

Source:

Health Canada. (2014). Guidelines for Canadian Drinking Water Quality: Summary Table. Retrieved from http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/sum_guide-res_recom_2014-10_eng.pdf

NSF International. NSF/ANSI 60 -2016. Drinking Water Treatment Chemicals – Health Effects [Internet]. Michigan: NSF International [cited 2018 May 7]. Available from: http://www.nsf.org/newsroom_pdf/NSF_60-13_-_watermarked.pdf

Past Communications to Committee:

- CWFC Agenda – June 9, 2016 | 4.1 Report on the Legislative Framework for the Authorization and Regulation of Community Water Fluoridation
- CWFC Agenda – June 9, 2016 | 4.2 Fluoridation of Drinking Water in the Region of Peel

Statement 20:

No one has the authority to force medication on people without their consent.

Response:

To be addressed by Legal Services in accompanying In Camera report.

Community Water

Fluoridation

Comments and Questions Directed to Staff to
Verify

Community Water Fluoridation Committee
Peel Regional Council

Jessica Hopkins, MD MHSc CCFP FRCPC
Medical Officer of Health, Region of Peel

Introduction

- The Community Water Fluoridation Committee (the “Committee”) was suspended on March 9, 2017 and reconvened on April 6, 2018
- At the April 19, 2018 meeting, the Committee requested staff validate a number of statements and questions concerning community water fluoridation (Recommendation CWFC-4-2018)
- This presentation addresses the 20 statements and 5 questions directed to staff

Comments and Questions for Staff to Verify

Statement #1: The Supreme Court of Canada ruled that Water Fluoridation is a Medication

Statement #2: Health Canada classifies Water Fluoridation a Water Treatment Chemical

Public Health (PH) response: **What is fluoride?**

- Fluoride is a naturally occurring mineral present in nearly all water sources
- Supports oral health by making the outer layer of teeth stronger and less likely to get cavities. It can also help prevent and reduce tooth decay
- When ingested, fluoride becomes part of the tooth structures during tooth formation and provides topical protection as it is retained in saliva and continually surrounding the tooth When added to drinking water systems, fluoride is classified as a direct additive or a drinking water treatment chemical
- Fluoride is not classified as a drug in water systems application, similar to iodine used to enrich salt

PH response: **What is community water fluoridation (CWF)?**

- CWF involves adjusting naturally occurring fluoride levels in water to optimal levels to protect against tooth decay (0.5 mg/L-0.8 mg/L)
- CWF benefits residents using the municipal water supply regardless of household income



Community water fluoridation in Peel

- Peel uses hydrofluorosilicic acid (HFSA), manufactured from calcium fluoride mineral, to fluoridate its water systems
- Peel's lake-based water supply is adjusted to a target concentration of 0.65 mg/L



Comments and Questions for Staff to Verify

- Statement #4: The MOHLTC states that tooth decay is a disease
- Statement #5: The MOHLTC states that water fluoridation prevents tooth decay
- Statement #7: The CDC states that fluoride is mainly effective in reducing cavities when applied topically
- Statement #8: Dr. Cooney admitted that water fluoridation prevents less than ½ cavity per person per lifetime
- Statement #9: The W.H.O. reports that cavity rates in unfluoridated counties are similar to fluoridated countries.
- Statement #10: Health Canada and the Provincial Minister of Health promote water fluoridation to be safe and effective
- Statement #18: The FDA has never approved fluoride supplements as safe and effective in preventing tooth decay.

PH response: **Community water fluoridation prevents tooth decay**

- Safely and effectively reduces and prevents tooth decay in children¹ and adults^{2, 3}
- Tooth decay can cause pain, school and work absences, difficulty concentrating and poor appearance



Comments and Questions for Staff to Verify

- Statement #10: Health Canada and the Provincial Minister of Health promote water fluoridation to be safe and effective.
- Statement #12: Fluoride, classified as a Neuro Toxin by the US EPA, is similar in toxicity to lead and arsenic.
- Statement #15: Toxicology reviews are recommended by Health Canada to ensure the safety of the fluoridation products.
- Statement #16: Toxicology studies are required on Fluoridation products to obtain NSF Standard 60 certification.
- Statement #17: Health Canada required toxicology reviews on HFSA have not been done.
- Statement #18: The FDA has never approved fluoride supplements as safe and effective in preventing tooth decay.
- Statement #19: Harmful chemicals that make up fluoridation products [HFSA] accumulate in our bodies.
- Question #5: Who is responsible to do the Health Canada Toxicology reviews on HFSA to ensure it's safe for human consumption?

PH response: **Community water fluoridation is safe**

- CWF as practiced in Peel is safe for all residents
- 430+ scientific studies showing safety with no link to toxicity⁴
 - Literature review
 - Internal and external peer-reviews
 - Public consultations
 - Federal-Provincial- Territorial approval processes
- Small increased risk of dental fluorosis (cosmetic impact)
 - In Peel, dental fluorosis affects 2.1% of children⁵

Comments and Questions for Staff to Verify

Question #3: Why do Malton's children have much higher cavity rates than the rest of the Region's children?



PH response: **Community water fluoridation saves money**

- Positive oral health is associated with access to preventive measures (individual, population) and dental care
- For every \$1 invested in CWF, \$32 is saved from dental treatment costs⁶
- Low income Canadians are almost twice as likely to suffer from poor oral health as high income Canadians. Community water fluoridation is a cost-effective way to narrow the oral health gap⁷
- Nearly 12.7% of Malton's population is living in low income and may be unable to afford appropriate dental care even with dental insurance. The prevalence of low income in Peel is 10.1% and Ontario is 9.8% of the population.⁸

Comments and Questions for Staff to Verify

- Statement #3: The Supreme Court Ruling that Water Fluoridation is a medication is still in effect.
- Statement #6: Section 7 of the Charter of Rights and Freedoms protect Canadians from forced medication.
- Statement #13: Health Canada has the authority to legislate water fluoridation to all Canadians.
- Statement #14: The Province of Ontario has the authority to legislate water fluoridation for all Ontarians.



PH response: **Keeping drinking water clean and safe**

- CWF is a lawful and recommended practice in Canada
- The Region of Peel's water meets all requirements under the legislation to be considered safe and of high quality
- It is a shared responsibility between all levels of government

Comments and Questions for Staff to Verify

- Statement #14: The Province of Ontario has the authority to legislate water fluoridation for all Ontarians..
- Statement #15: Toxicology reviews are recommended by Health Canada to ensure the safety of the fluoridation products.
- Statement #16: Toxicology studies are required on Fluoridation products to obtain NSF Standard 60 certification.
- Statement #17: Health Canada required toxicology reviews on HFSA have not been done.

PH response: Keeping drinking water clean and safe - Federal

- Health Canada reviews the science to ensure safety and effectiveness and provides the guideline for fluoride in drinking water
- Health Canada established the maximum acceptable concentration (MAC) for fluoride in drinking water of 1.5 mg/L and the optimal concentration of 0.7 mg/L
 - The Ministry of the Environment and Climate Change recommends a concentration range of 0.5 – 0.8 mg/L
- Toxicology studies are conducted on substances that are ingested (i.e., fluoride)
- HFSA dissociates when mixed with drinking water, which means that the fluoride ion, silicates (sand) and hydrogen separate from one another. Fluoride, not HFSA, is ingested in water from CWF systems.

Comments and Questions for Staff to Verify

- Statement #14: The Province of Ontario has the authority to legislate water fluoridation for all Ontarians..
- Statement #15: Toxicology reviews are recommended by Health Canada to ensure the safety of the fluoridation products.
- Statement #16: Toxicology studies are required on Fluoridation products to obtain NSF Standard 60 certification.
- Statement #17: Health Canada required toxicology reviews on HFSA have not been done.

PH response: Keeping drinking water clean and safe - Provincial

- Province of Ontario provides legislation for CWF:
 - Fluoridation Act (1990) states that municipalities have the authority and decision-making power regarding CWF
 - Safe Drinking Water Act (2002) regulates CWF

Comments and Questions for Staff to Verify

- Statement #5: The Minister of Health and Long-Term Care states that water fluoridation prevents tooth decay.
- Statement #7: The CDC states that fluoride is mainly effective in reducing cavities when applied topically.
- Statement #8: Dr. Cooney admitted that water fluoridation prevents less than ½ cavity per person per lifetime.
- Statement #9: The W.H.O. reports that cavity rates in unfluoridated counties are similar to fluoridated countries.
- Statement #10: Health Canada and the Provincial Minister of Health promote water fluoridation to be safe and effective.

PH response: Health experts recommend community water fluoridation

- The CDC named community water fluoridation as 1 of 10 great public health achievements of the 20th century
- Over 90 national and international governments and professional health organizations support CWF as safe and effective for the prevention of tooth decay, including:
 - Government of Canada
 - Canadian Dental Association
 - Canadian Medical Association
 - Ontario Medical Association
 - Government of Ontario
 - World Health Organization
 - Centres for Disease Control & Prevention
 - US Food and Drug Administration
 - American Dental Association



Comments and Questions for Staff to Verify

Statement #11: 70% of Canadian towns and cities have discontinued water fluoridation.

Question #1: Why hasn't the Province or Health Canada legislated Water Fluoridation to all Canadians?

Question #2: Why has the responsibility to approve water fluoridation been given to Municipal Councillors when 70% of Canadians have rejected the practice?

Question #4: Why did the Provincial Government fail to approve MPP Delany's Private Members Bill to legislate water fluoridation in Ontario?

PH response: Considerations for community water fluoridation

- Ontario Government strongly encourages CWF but recognizes the many factors municipalities must consider:
 - Size and sophistication of water systems
 - Financial considerations (i.e. cost of installation/maintenance)
 - Resident/community input
- No municipality has discontinued water fluoridation on the advice of their Medical Officer of Health

Removing fluoride: A disservice to Peel residents

- As we have seen in other communities (e.g. Calgary and Windsor) Peel residents would experience increased rates of cavities if CWF is discontinued⁹⁻¹⁰
- CWF is a safe and effective practice that supports oral health over the life course
- CWF benefits the health of all residents in the Peel community, regardless of age, socioeconomic status, education, oral hygiene practices, employment or access to dental care, making it a truly equitable public health practice



Community Water Fluoridation in Peel

peelregion.ca/health/fluoride/

Endnotes

1. Ihezor-Ejiofor Z, Worthington HV, Walsh T, O'Malley L, Clarkson JE, Macey R, Alam R, Tugwell P, Welch V, Glenny A (2015). Water fluoridation for the prevention of dental caries (review). *Cochrane Database of Systematic Reviews*, Issue 6. Art. No.: CD010856.
2. Health Canada. (2016). Fact sheet – Community water fluoridation. Available from: <https://www.canada.ca/en/services/health/publications/healthy-living/fluoride-factsheet.html>
3. National Health and Medical Research Council (NHMRC) 2017, Information paper – Water fluoridation: dental and other human health outcomes, report prepared by the Clinical Trials Centre at University of Sydney, NHMRC; Canberra. See page 24.
4. See Section 13 of *The Guidelines for Canadian Drinking Water Quality: Guideline Technical Document – Fluoride* for the full list of references that support the review's maximum acceptable concentration (MAC) for fluoride in drinking water safety of 1.5 mg/L. This review assessed all identified human health risks.
5. Peel Public Health. Oral Health in Peel: A Taste of Risk Factors and Oral Health Outcomes. 2017
6. O'Connell J, Rockell J, Ouellet J, Tomar SL, Maas W. (2016). Cost and savings associated with community water fluoridation in the United States. *Health Affairs* [Internet]. 2016 [cited 2018 May 31]; 35(12):2224-2232. Available from: https://www.healthaffairs.org/doi/abs/10.1377/hlthaff.2016.0881?url_ver=Z39.882003&rfr_id=ori%3Arid%3Acrossref.org&rfr_dat=cr_pub%3Dpubmed
7. Health Canada. (2016). Fact sheet – Community water fluoridation. Available from <https://www.canada.ca/en/services/health/publications/healthy-living/fluoride-factsheet.html>
8. [2016 Census Profile, Ontario, Mississauga—Malton](#)
9. McLaren, L., Patterson, S., Thawer, S., Faris, P., McNeil, D., Potestio, M., & Shwart, L. (2016). Measuring the short-term impact of fluoridation cessation on dental caries in Grade 2 children using tooth surface indices. *Community Dentistry and Oral Epidemiology*, 44(3), 274-282
10. Ihezor-Ejiofor Z, Worthington HV, Walsh T, O'Malley L, Clarkson JE, Macey R, Alam R, Tugwell P, Welch V, Glenny A (2015). Water fluoridation for the prevention of dental caries (review). *Cochrane Database of Systematic Reviews*, Issue 6. Art. No.: CD010856.

5.1-1

From: Liesa Cianchino
Sent: May 10, 2018 9:22 AM
To: West, Helena; Macintyre, Ava
Cc: ZZG-RegionalClerk
Subject: Re: RESPONSE LETTER FROM THE MINISTRY AND CONCERNED RESIDENTS OF PEEL TO END FLUORIDATION REQUEST

RE: RESPONSE LETTER FROM THE MINISTRY AND REQUEST

May 10, 2018

Dear Members of the Water Fluoridation Committee, Regional Councillors, Staff and City Solicitors:

On behalf of the Concerned Residents of Peel to End Fluoridation, we would like to thank Councillor Sprovieri for his determination to help move the issue to it's final stage.

The unreasonable delays in the political process have been witnessed first hand by the concerned residents and unfortunately, everyone's patience is running thin.

For many months I tried to meet with Minister Hoskins to find out why he did not respond to the Regions letters, in particular the letter dated February 22, 2017. The unreasonable delays prompted me to get the Office of the Ombudsman involved. They too were unsuccessful in obtaining a response.

Finally, the Region received a response from the Deputy Minister Roselle Martino on March 23, 2018.

Suffice it to say, the response was a non response. **It did NOT answer the necessary requests from the Resolution.**

This is unacceptable for a Ministry whose mandate it is to protect the health and well being of the citizens of Ontario. This blatant disregard towards the Region of Peel and the concerned residents is an example of the power of politics. The delay tactics could have dragged on for another year had we not put the pressure on the Province.

On a positive note. Dr. Gilles Parent was invited to make a presentation on May 19th, 2018 in response to the Ministry's letter.

Dr. Parent articulated the **irrefutable facts that "Fluoridation Chemicals" aka HFSA are unregulated, untested, unapproved, ineffective drugs.**

It's important for the Region to note that residents are not willing to accept further delays given all the comprehensive information the Region of Peel has heard to date.

REFERRAL TO _____
RECOMMENDED _____
DIRECTION REQUIRED _____
RECEIPT RECOMMENDED _____

5.1-2

After Dr. Parent's presentation, Councillor Palleschi issued a series of excellent statements/questions for verification from staff. As you can imagine, the first thing that came to mind was the fact that we would lose more time in the process.

On behalf of the concerned residents, I would like to request that a **time frame be given to the residents as to when Staff will provide the verification/answers to Councillor Palleschi's request.**

Please see below. I have compiled some key points from Dr. Parents excellent presentation and listed them below so that all Councillors have this compelling information that is **irrefutable and requires immediate action without further delays.**

Thank you.

Respectively Submitted,
Liesa Cianchino
Chair Concerned Residents of Peel to End Fluoridation
Founding Member Worldwide Alliance to End Fluoridation
(CA)Past Board Member(US)Moms Against Fluoridation

REGION OF PEEL'S LETTER TO THE PROVINCE February 12, 2012 and February 22, 2017

February 12, 2012 Passed a Resolution calling Health Canada to do at least:

1. **1 long-term toxicology study to determine the health effects in humans**
2. **at least 1 properly conducted controlled clinical trial to determine effectiveness**

Objective:

To reassure the citizens of Peel that the use of fluorosilicates added to drinking water for the purpose of treating a disease is safe.

Region of Peel failed to reassure the citizens of Peel that the use of fluorosilicates added to the drinking water for the purpose of treating a disease is safe.

February 22, 2017 Passed a Resolution calling the Ministry of Health and Long Term Care:

1. **To undertake appropriate and comprehensive toxicity testing necessary to reassure the public that the use of HFSA in water fluoridation treatments is safe;**

5.1-3

1. **Take legislative responsibility for the regulation and administration of HFSA in water fluoridation treatments across the province relieving local governments from what is a provincial responsibility.**

The second point is problematic in that if it's illegal for the Region to add an unregulated, untested, unapproved and ineffective drug to our drinking water, then the same rules apply to the Province. No government body can force a medication upon the citizenry without their informed consent.

Once again, Region of Peel failed to ascertain the necessary information to reassure the citizens that the use of HFSA in water fluoridation treatment is safe.

MINISTRY OF HEALTH'S RESPONSE LETTER TO PEEL REGION

March, 23, 2018

Public health Ontario has review NSF/ANSI 60 on behalf of the ministry. NSF/ANSI 60 establishes requirements to be protective of

human health for products and their impurities that may be added directly during water treatment, storage and distribution.

The established safeguard noted above continue to ensure the safety of fluoridated drinking water in Ontario.

The ministry will also continue to monitor and review new research.

The ministry urges all municipalities to protect their communities from avoidable health issues by maintaining fluoride in their drinking water, to promote the health of all residents.

Ms Roselle Martino, assistant Deputy Minister is misleading the Community Water Fluoridation Committee, Regional Councillors and City Staff, Citizens and the Media:

1. **The Ministry hasn't supplied the toxicological review as requested by Peel Region to prove safety of HFSA, so without it, it cannot be claimed SAFE;**
2. **The Ministry implies** that NSF/ANSI 60 establishes requirements to be protective of human health for fluoridation chemicals **WHICH THEY DO NOT** (see NSF disclaimers);
3. **The Ministry implies** that NSF/ANSI 60 has the jurisdiction and the competence to guarantee the efficiency of **HFSA WHICH IT DOES NOT;**
4. **The Ministry implies** that it is legal and ethical to administer to a population a water treatment chemical to mitigate and prevent a disease **WHICH IT IS NOT.**
5. **The Ministry assumes** that fluoridation would supply to each citizen an exact and proper amount of fluoride when using tap water as a vehicle for the administration of the fluoride without considering the huge variability of daily intake of water and fluoride from all other sources. **It make fluoridation of water an absurd vehicle of distribution of a drug as a daily dose cannot be controlled.**
6. **The Ministry assumes** erroneously that concentration is equivalent to dose while such a concept is obviously invalid.

5.1-4

7. **The Ministry assumes** that it knows the exact daily dose of fluoride needed to prevent dental decay without causing any harm to anyone, including the most vulnerable subjects in the society; babies, children, the infirm, the elderly and those that drink a lot of water.
8. **The Ministry assumes** that it knows what no health authority in the world knows, the exact effective and safe dose of fluoride; that is either 1, 2, 3, 4, 5, 6 or 7 mg daily. **There is no scientific consensus on the exact effective and safe dose.**
9. **The Ministry assumes** that it knows what no health authority in the world knows, the exact effective and safe dose of fluoride that would take in account the weight of the subject expressed in mg/kg/day; is it 0.01, 0.02, 0.03, 0.04, 0.05, 0.06, 0.07, 0.08, 0.09 mg/kg/day.
10. **Without knowing what the exact appropriate intake of fluoride that would be safe for the most vulnerable and that would be effective to prevent decay if such a dose would be proven safe and effective, the Ministry is putting the entire population at risk of side effects, including dental fluorosis that is already reported at epidemic levels.**

NSF/ANSI 60

TRADE REGULATORY ORGANIZATIONS

- NO **LEGAL JURISDICTION** ON PRODUCTS USED FOR TREATING OR PREVENTING A DISEASE.
- NO COMPETENCY IN EVALUATING THE EFFECTIVENESS OF A SUBSTANCE USED FOR A THERAPEUTIC PURPOSE.
- NO COMPETENCY IN EVALUATING THE SAFETY OF A SUBSTANCE USED FOR A THERAPEUTIC PURPOSE.

NSF DOCUMENT DISCLAIMERS

NO CANADIAN OR AMERICAN GOVERNMENTAL AGENCY HAS EVER PROVIDED

SAFETY TOXICOLOGY

STUDIES

ARE FLUORIDATION CHEMICALS COMPLIANT WITH STANDARD 60 OF THE NATIONAL SANITATION FOUNDATION (NSF)?

NO...

They have a NSF certificate but do not meet all the requirements of NSF Standard 60.

The main essential requirement for the NSF Standard 60 is **Chronic Toxicological Tests** that demonstrate safety of the HFSA.

«**Chronic**» means «**Long Term**»

Are there any Chronic Toxicology Tests available for HFSA?

NO...

NSF Fact Sheet states that toxicological testing is required, but the NIEHS 2001 Review, US EPA and Safety Data Sheets state they

DO NOT EXIST.

NO...

NSF Fact Sheet states that toxicological testing is required, but the NIEHS 2001 Review, US EPA and Safety Data Sheets state they

DO NOT EXIST.

- **Letters from the US Congressional Hearings**
- **US EPA**

- National Institute of Environmental Health Sciences 2001 Review
- HEALTH CANADA
- ONTARIO MINISTRY OF HEALTH
- NSF

state that fluoridation products do NOT have TOXICOLOGICAL STUDIES

WHICH HEALTH AUTHORITIES CLAIM ACCOUNTABILITY FOR FLUORIDATION?

Therefore...

They have not been proven safe...

IF FLUORIDATION CHEMICALS DO NOT HAVE LONG TERM TOXICOLOGICAL STUDIES, THEN

SAFETY CANNOT BE DEMONSTRATED

Therefore...

**They do not satisfy NSF Standard 60...
Therefore...**

THE CERTIFICATION COULD BE CONSIDERED AS INVALID?

They are not compliant with Quebec and Ontario law (Ontario Safe Drinking Water Act)

**HEALTH CANADA
HAS NOT APPROVED ANY FLUORIDATION
CHEMICALS**

AS DRUGS.

**IT IS ILLEGAL TO ADMINISTER AN APPROVED OR UNAPPROVED
DRUG
WITHOUT A MEDICAL LICENSE, AND WITHOUT INFORMED CONSENT
TO ANY RESIDENT.**

**ADMINISTERING ANY DRUG, APPROVED OR UNAPPROVED, TO
RESIDENTS**

**WITHOUT CONSENT
CONTRAVENES ARTICLE 7 OF THE
CANADIAN CHARTER OF RIGHTS AND FREEDOMS**

Drugs Should Not Be Put Into Drinking Water Because:

**No one can control how much of any drug is consumed daily by each
individual Citizens are deprived of Informed Choice:**

- Information regarding risks and benefits
- Choice to refuse or accept drug
- No trained professional to assess medical need and adverse effects

**MUNICIPALITIES SHOULD NOT USE THE
PUBLIC WATER SUPPLY AS A
VEHICLE TO ADMINISTER A MEDICATION TO THE POPULATION**

**Fluoridation Chemicals
NOT Regulated = NOT Safe
Don't we deserve to be protected by
Government regulation?**

Who determines safety and efficacy of fluoridation chemicals?

NO ONE!

NO Government Agency in Canada regulates fluoridation chemicals.

WHICH HEALTH AUTHORITIES CLAIM ACCOUNTABILITY FOR FLUORIDATION?

NONE...

NO ACCOUNTABILITY

It is not logical to accept the advice of those who accept no responsibility for these chemicals:

- Health Canada
- Ontario Ministry of Health
- Ontario Ministry of Environment
- Ontario Ministry of Health Promotion
- Ontario Dental Association
- And over 90 organisations who endorse fluoridation

Finally, who's Accountable?

Municipalities are legally responsible:

- **You, the councillors, are the final decision makers**
- **for choosing fluoridation chemicals**
- **for adding fluoridation chemicals**

PLEADING IGNORANCE OF THE LAW IS NOT AN EXCUSE

False Assumptions

- **Tax payers incorrectly assume** that these products are compliant with Canadian laws,
- **Tax payers incorrectly assume** that these products have been assessed for safety,
- **Tax payers incorrectly assume** that the product reduces cavities when swallowed,

- **Taxpayers incorrectly assume** that the Health Canada panel evaluating these products had the necessary expertise
- **Taxpayers incorrectly assume** that the Health Canada panel reviewed all available research – not just the research that supports the policy.

**THE MINISTRY'S RESPONSE DOES NOT ANSWER THE REGIONS
RESOLUTION
REQUESTING TO ASSURE THE RESIDENTS OF THE SAFETY AND
EFFICACY OF HFSA
FOR THE SOLE PURPOSE OF PREVENTING DENTAL CAVITIES
TO ALL RESIDENTS OF PEEL
BY USING AN UNAPPROVED DRUG TO MEDICATE THE RESIDENTS
WITHOUT THEIR INFORMED CONSENT**

**AS YOU HAVE LEARNED, THE PROVINCE HAS NOT
PROVIDED THE ANSWERS TO YOU IN ORDER FOR REGIONAL
COUNCIL
TO REPORT BACK TO THE CONCERNED RESIDENTS OF PEEL
WHO HAVE BEEN ASKING FOR
PROOF OF SAFETY AND EFFICACY SINCE 2011
NO EVIDENCE OF SAFETY AND EFFICACY (NOT ENDORSEMENTS)
MEANS
YOU CANNOT CLAIM SAFETY AND EFFICACY
THEREFORE, THE INFORMATION YOU ARE RELYING ON FROM
PUBLIC OFFICIALS IS INVALID AS CLAIMS FOR
SAFETY AND EFFICACY OF HFSA
MUST BE BACKED UP BY REQUIRED TOXICOLOGICAL STUDIES
WHICH HAS BEEN CONFIRMED NUMEROUS TIMES BY MULTIPLE
EXPERTS
DO NOT EXIST!**

THEREFORE, IT IS INCUMBENT UPON YOU, AS THE
ULTIMATE DECISION MAKERS,
TO PROTECT THE HEALTH AND WELL BEING OF THE RESIDENTS
YOU WERE ELECTED TO SERVE AND PROTECT.

**PLEASE CEASE AND DISMISS THIS
UNREGULATED, UNTESTED, UNETHICAL, UNAPPROVED AND
INEFFECTIVE PRACTICE
WITHOUT FURTHER DELAY!**

ALL RESIDENTS OF PEEL HAVE THE RIGHT TO SAFE DRINKING
WATER
WHICH IS A FUNDAMENTAL HUMAN RIGHT.

PLEASE JOIN THE 95% OF THE WORLD THAT DOES NOT
FLUORIDATE.

**REDIRECT \$500,000.00 SPENT ON THE INEFFECTIVE FLUORIDATION
INTO PUBLIC HEALTH DENTAL PROGRAMS OF PREVENTION**

**WE HAVE PROVEN THAT
FLUORIDATION CHEMICALS ARE
UNREGULATED
UNTESTED
UNAPPROVED
INEFFECTIVE
DRUGS**

THE PRECAUTIONARY PRINCIPAL SHOULD BE APPLIED



NHMRC
Clinical Trials Centre

HEALTH EFFECTS OF WATER FLUORIDATION

EVIDENCE EVALUATION REPORT

NHMRC CLINICAL TRIALS CENTRE

THE UNIVERSITY OF SYDNEY

24 August 2016

Suggested citation: Jack, B., Ayson, M., Lewis, S., Irving, A., Agresta, B., Ko, H., Stoklosa, A. 2016, *Health Effects of Water Fluoridation: Evidence Evaluation Report*, report to the National Health and Medical Research Council, Canberra.

The NHMRC Clinical Trials Centre (CTC) is a not-for-profit, academic research organisation that coordinates and conducts investigator-initiated trials, involving researchers from Australia and internationally. The CTC upholds a core commitment to integrity and transparency in clinical trials research, including publication of our research independent of funder influence. The National Health and Medical Research Council (NHMRC) provided initial funding to establish the CTC and we participate in competitive grant processes (NHMRC's and others) to secure funding for our continuing research activities, which includes tenders for government projects such as systematic reviews and technical writing of health and medical information.

A team within the NHMRC which is separate from the grants management area of NHMRC is responsible for developing evidence-based clinical and public health guidelines and advice. It is this section of NHMRC that advertised for tenders from panellists of the NHMRC Health Evidence Panel to undertake this evaluation. The CTC participated in a transparent panel procurement process to win this contract to evaluate the evidence as documented in this report.

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ABBREVIATIONS

| | |
|--------|---|
| AIHW | Australian Institute of Health and Welfare |
| AMSTAR | A Measurement Tool to Assess Systematic Reviews |
| ANOVA | analysis of variance |
| aOR | adjusted odds ratio |
| BMI | body mass index |
| CDC | Centers for Disease Control and Prevention |
| CI | confidence interval |
| CKD | chronic kidney disease |
| CPI | community periodontitis index |
| CWF | community water fluoridation |
| DAI | Dental Aesthetic Index |
| DDE | Developmental Defects of Enamel |
| dmfs | decayed, missing, and filled deciduous tooth surfaces |
| DMFS | decayed, missing, and filled permanent tooth surfaces |
| dmft | decayed, missing, and filled deciduous teeth |
| DMFT | decayed, missing, and filled permanent teeth |
| DBP | diastolic blood pressure |
| EPA | Environmental Protection Agency |
| FT3 | free total triiodothyronine |
| FT4 | free thyroxine |
| GRADE | Grading of Recommendations Assessment, Development and Evaluation |
| GP | general practitioner |
| HR | hazard ratio |
| IQ | intelligence quotient |
| IQR | inter-quartile range |
| IRR | incidence rate ratio |
| IV | inverse variance |
| kg | kilogram |
| L | litre |
| LA | loss of attachment index |
| mg | milligram |
| mm | millimetre |
| mmHg | millimetres of mercury |
| mU | milliunit |
| ng | nanogram |
| NHMRC | National Health and Medical Research Council |
| NICE | National Institute for Health and Care Excellence |
| NOF | naturally occurring fluoride |

| | |
|-------|---|
| NR | not reported |
| NRC | National Research Council |
| OR | odds ratio |
| PHE | Public Health England |
| PICOS | population, intervention, comparator, outcome, study type |
| ppm | parts per million |
| pyar | person-years at risk |
| RR | relative risk |
| SCHER | Scientific Committee on Health and Environmental Risks |
| SBP | systolic blood pressure |
| SD | standard deviation |
| SE | standard error |
| SES | socioeconomic status |
| SIGN | Scottish Intercollegiate Guidelines Network |
| T3 | triiodothyronine |
| T4 | thyroxine |
| TFI | Thylstrup-Fejerskov index |
| TSH | thyroid stimulating hormone |
| TSIF | Tooth Surface Index of Fluorosis |
| TT3 | total triiodothyronine |
| TT4 | total thyroxine |
| UK | United Kingdom |
| US | United States |
| WIS | water improvement scheme |

EXECUTIVE SUMMARY

BACKGROUND

In 2007, the National Health and Medical Research Council (NHMRC) published *A Systematic Review of the Efficacy and Safety of Fluoridation* (NHMRC 2007a). Based on the findings presented in the review, NHMRC issued a public statement that recommended:

"that water be fluoridated in the target range of 0.6 to 1.1 mg/L, depending on climate, to balance reduction of dental caries and occurrence of dental fluorosis".

The purpose of this review is to update the evidence on the health effects of water fluoridation from NHMRC's 2007 review to assist NHMRC to provide evidence-based guidance on the potential benefits and harms of water fluoridation.

METHODS

The review process included the following activities:

1. a systematic review of the dental effects of water fluoridation, which consisted of:
 - a. an overview of reviews on the effects of water fluoridation on dental caries;
 - b. a systematic review of recent primary studies on the effects of water fluoridation on dental caries not identified in the reviews included in the overview;
 - c. a critical appraisal of the evidence on dental fluorosis included in the existing Cochrane review (Iheozor-Ejiogor et al 2015); and
2. a systematic review of the other health effects of water fluoridation.

Systematic review of the dental effects of water fluoridation

Two systematic literature searches were undertaken. The first was to identify and evaluate existing reviews that were published between 1 October 2006 and 12 November 2015 which evaluated evidence for the effect of water fluoridation on dental caries. The second was to identify primary studies published between 1 October 2006 and 17 November 2015 reporting on the effect of water fluoridation on dental caries not included in the identified reviews. Studies were included if they compared non-fluoridated drinking water (<0.4 ppm) with water fluoridated to within current Australian levels (0.4 ppm–1.5 ppm) and reported on dental caries.

Included reviews from the overview component were assessed for quality using the AMSTAR (A Measurement Tool to Assess Systematic Reviews) tool. The primary studies included in these reviews were not individually assessed for risk of bias by the evidence reviewers. Included studies from the systematic review of recent primary studies component were assessed for their risk of bias and classified as being of high, acceptable or low quality. The strength of the evidence for each outcome was assessed using the GRADE (Grading of Recommendations Assessment, Development and Evaluation) system for rating the quality of evidence.

Systematic review of the health effects of water fluoridation

A comprehensive literature search was undertaken to identify primary studies reporting on health effects associated with water fluoride that were published between 1 October 2006 and 14 October 2014. Studies were included if they reported on a health effect (other than dental caries or dental fluorosis) in humans and assessed either:

- water with fluoride compared to unfluoridated water, or
- water with fluoride at one level compared to water with fluoride at a different level.

Included studies were assessed for their risk of bias and classified as being of high, acceptable or low quality. To aid in the interpretation of the results, the evidence for each outcome was presented

based on the applicability of the included studies. Study applicability was based on how similar the water fluoride levels reported within each study were to those experienced in Australia:

1. High applicability studies: unfluoridated water (<0.4 ppm¹ fluoride) vs. water with up to 1.5 ppm fluoride
2. Partial applicability studies: unfluoridated water (<0.4 ppm fluoride) vs. water with >1.5 ppm fluoride; and water with 0.4–1.5 ppm fluoride vs. water with >1.5 ppm fluoride
3. Limited applicability studies: studies in which all groups compared had water fluoride levels >1.5 ppm

The strength of the evidence for each outcome was assessed using the GRADE system for rating the quality of evidence.

RESULTS

Findings from the review on the dental effects of water fluoridation

The systematic review identified 3 relevant reviews and 25 primary studies that reported on dental caries. One of the identified reviews reported on dental fluorosis also. Seven other studies identified in the systematic review of other health effects reported on other dental outcomes and were included in this section. The results for dental caries and dental fluorosis are reported separately from other outcomes.

Dental caries in deciduous teeth

Studies reporting on dental caries in deciduous teeth measured caries by using the number of decayed, missing and filled deciduous teeth per individual (dmft) or the number of decayed, missing and filled tooth surfaces (dmfs). The results are reported as mean dmft/s, proportion of individuals caries-free (%dmft/s=0) or prevalence of caries experience (%dmft/s>0). The summary of findings for these outcomes is presented in Table 1.

The quality of the two included reviews that reported on caries in deciduous teeth was mixed with one review scoring high on the AMSTAR tool and the other scoring low. The primary studies included in one review were all of low quality—the other review did not undertake an assessment of methodological quality of the included primary studies.

Most of the primary studies identified in the systematic review of recent primary studies were assessed as being of acceptable quality with moderate risk of bias, representative included populations, and measurement of known confounding factors. Those studies assessed as low quality generally had high risk of bias due to poor or unclear selection methods.

The review identified consistent evidence that water fluoridation was associated with a reduced mean dmft/s and prevalence of caries in deciduous teeth and also an increase in the proportion of individuals with caries-free deciduous teeth.

¹ The units 'ppm' are equivalent to 'mg/L'

Table 1 Summary of findings for dental caries in deciduous teeth

| Outcomes | Illustrative comparative risks* (95% CI) | No of participants (studies) | Quality of the evidence (GRADE) ¹ | Comments |
|---|---|-----------------------------------|--|---|
| Caries in deciduous teeth assessed using dmft | The pooled effect estimate was a reduction of 1.81 (95%CI: 1.31 to 2.31) in dmft for children aged 3–12 years. This indicates a reduction in dmft of 35% in the water fluoridation groups over and above that for the control groups. | 44,268 (9 observational studies) | ⊕○○○ | A single well-conducted systematic review. The GRADE assessment was downgraded twice for high risk of bias and indirectness (due to lack of contemporary evidence). The authors also upgraded twice for a very large effect size, however GRADE does not allow upgrading if the evidence has already been downgraded. Therefore the quality has been revised. |
| | Median caries reduction of 44% (range 29% to 68%) in children aged 3–12 years | NR (21 observational studies) | ⊕○○○ | A single systematic review of very limited methodological quality. Downgraded for unclear risk of bias, indirectness and imprecision. |
| | Significant reduction in mean dmft in children (5–10 years) with exposure to community water fluoridation. Mean dmft decreased by 0.37 (95%CI: 0.48, 0.2) in one study. | >40,000 (3 observational studies) | ⊕⊕○○ | Includes one large study from England using national data and a single study set in Australia with good sample size. Both were of acceptable quality, with adjustment for confounders in a setting of CWF. |
| Caries in deciduous teeth assessed using dmfs | Median caries reduction of 33% (range: 14%–66%) in 5 to 11-year-olds | NR (21 observational studies) | ⊕○○○ | A single systematic review of very limited methodological quality. Downgraded for unclear risk of bias, indirectness and imprecision. |
| | Significant reduction in mean dmfs in children (5–11 years) with exposure to community water fluoridation in two studies. Significant inverse association between mean dmfs and increasing fluoride levels in two studies | 5,546 (4 observational studies) | ⊕⊕○○ | Two acceptable quality studies set in Australia using national survey data with good sample size and adjustment for confounders in the setting of CWF. Two studies (one low quality and one acceptable quality) in the US and Vietnam of limited applicability to the Australian context. |
| Proportion of caries-free deciduous teeth assessed using %dmf/s=0 | The pooled effect estimate was an increase of 15% (95%CI: 11% to 19%) in the proportion of caries-free infants and children (3–12 years) in areas with water fluoridation. | 39,966 (9 observational studies) | ⊕○○○ | A single well-conducted systematic review. The GRADE assessment was downgraded twice for high risk of bias and indirectness (due to lack of contemporary evidence). The authors also upgraded twice for a very large effect size, however GRADE does not allow upgrading if the evidence has already been downgraded. Therefore the quality has been revised. |

| Outcomes | Illustrative comparative risks* (95% CI) | No of participants (studies) | Quality of the evidence (GRADE) ¹ | Comments |
|--|--|----------------------------------|--|---|
| - | The proportion of caries-free Indigenous children (5–10 years) was greater with exposure to community water fluoridation (OR=1.27; 95%CI: 0.98–1.63). | NR (1 observational study) | ⊕⊕○○ | A single acceptable quality study from Australia in the setting of CWF. |
| Caries prevalence in deciduous teeth assessed using %dmf/s>0 | Significant reduction in the prevalence of caries in children (4–11 years) with exposure to community water fluoridation | >4,323 (6 observational studies) | ⊕⊕○○ | Includes one large study from England using national data and four studies set in Australia with good sample size. All were of acceptable quality, with adjustment for confounders in a setting of CWF. |
| Prevalence of early childhood caries | Water fluoridation was significantly associated with a reduction in the prevalence of early childhood caries in infants and children aged 36–71 months (OR=0.40; 95%CI: 0.25–0.63) | 5,822 (1 observational study) | ⊕○○○ | A single study of acceptable quality set in South Africa using survey data. Downgraded for indirectness. |

Note: Key to GRADE quality of evidence: ⊕⊕⊕⊕ = We are very confident in the reported associations; ⊕⊕⊕○ = We are moderately confident in the reported associations; ⊕⊕○○ = Our confidence in the reported associations is limited; ⊕○○○ = We are not confident about the reported associations.

Note: We have attempted as far as possible to use the following definitions: infants (0–4 years); children (5–11 years); adolescents (12–17 years); adults (18–64 years) and later adulthood (65+ years)

Abbreviations: dmft/s = number of decayed, missing and filled deciduous teeth/surfaces; dft = number of decayed and filled deciduous teeth; DMFT/S = number of decayed, missing and filled permanent teeth/surfaces; CWF = community water fluoridation; CI = confidence interval; NR = not reported

¹ For details of the assessment, please see the individual outcome in the Results section of this report.

Dental caries in permanent teeth

Studies reporting on dental caries in permanent teeth also measured caries by using the number of decayed, missing and filled permanent teeth per individual (DMFT) or the number of decayed, missing and filled tooth surfaces (DMFS). The results are reported as mean DMFT/S, proportion individuals caries-free (%DMFT/S=0) or prevalence of caries experience (%DMFT/S>0). The summary of findings for these outcomes is presented in Table 2.

The quality of the three included reviews for caries in permanent teeth was mixed with one review scoring high on the AMSTAR tool, one scoring in the middle range and the last scoring low. The primary studies included in one review were all of low quality—the other two reviews did not undertake an assessment of methodological quality.

Most of the primary studies identified in the systematic review of recent primary studies were assessed as being of acceptable quality with moderate risk of bias, representative included populations, and measurement of known confounding factors. Those studies assessed as low quality generally had high risk of bias due to poor or unclear selection methods.

The review identified consistent evidence that water fluoridation was associated with a reduced mean DMFT/S and prevalence of caries in permanent teeth and also an increase in the proportion of individuals with caries-free permanent teeth.

Table 2 Summary of findings for dental caries in permanent teeth

| Outcomes | Illustrative comparative risks* (95% CI) | No of participants (studies) | Quality of the evidence (GRADE) ¹ | Comments |
|---|---|-----------------------------------|--|---|
| Caries in permanent teeth assessed using DMFT | The pooled effect estimate was a reduction of 1.16 (95%CI: 0.72 lower to 1.61 lower) in mean DMFT in the areas with water fluoridation for children aged 8–11 years. This indicates a reduction in DMFT of 26% in the water fluoridation groups over and above that for the control groups ⁶ . | 78,764 (10 observational studies) | ⊕○○○ | A single well-conducted systematic review. The GRADE assessment was downgraded twice for high risk of bias and indirectness (due to lack of contemporary evidence). The authors also upgraded twice for a very large effect size, however GRADE does not allow upgrading if the evidence has already been downgraded. Therefore the quality has been revised. |
| | The median percentage reduction of caries in permanent teeth was 37% (range: 5%–85%) in participants aged 8–51 years. | NR (37 observational studies) | ⊕○○○ | A single systematic review of very limited methodological quality. Downgraded for unclear risk of bias, indirectness and imprecision. |
| | Significant reduction in mean DMFT in adults (18–65+ years) with exposure to fluoridated water | 3,080 (4 observational studies) | ⊕○○○ | A systematic review of reasonable methodological quality downgraded because of no clear reporting of assessment of risk of bias, and serious indirectness and imprecision |
| | Significant reduction in mean DMFT in adolescents and adults (≥11 years) with exposure to community water fluoridation (reduced by 0.19; 95%CI: 0.27 reduction, 0.11 reduction in one study) | >12,700 (7 observational studies) | ⊕⊕○○ | Five acceptable quality studies set in Australia in the context of CWF. Single large study of acceptable quality from England using a national database with adjustment for confounders in a setting of CWF. |
| Caries in permanent teeth assessed using DMFS | The median percentage reduction of caries in permanent teeth was 29% (range: 0%–50%) in participants aged 5–35 years. | NR (16 observational studies) | ⊕○○○ | A single systematic review of very limited methodological quality. Downgraded for unclear risk of bias, indirectness and imprecision. |
| | Significant reduction in mean DMFS in children and adolescents (8–14 years) with exposure to community water fluoridation in two studies Significant inverse association between ≥75% lifetime exposure to water fluoridation and mean DFS (participants 15+ years) in one study. Non-significant inverse relationship between naturally occurring fluoride | 12,344 (4 observational studies) | ⊕⊕○○ | Two studies of acceptable quality set in Australia in the context of CWF. One study set in Vietnam of limited applicability. One regression analysis from Australia. |

| Outcomes | Illustrative comparative risks* (95% CI) | No of participants (studies) | Quality of the evidence (GRADE) ¹ | Comments |
|---|--|-----------------------------------|--|---|
| | levels and mean DMFS (participants 6–17 years) in one study. | | | |
| Caries prevalence (permanent teeth) assessed with %DMFT/S>0 | Significant reduction in the prevalence of caries in children, adolescents and adults (6–21 years) with exposure to community water fluoridation | >39,750 (9 observational studies) | ⊕⊕○○ | Includes a single large study of acceptable quality from England using a national database with adjustment for confounders in a setting of CWF. Also six acceptable quality studies from Australia. |
| Proportion of caries-free children (permanent teeth) assessed with %DMFT/S =0 | The pooled effect estimate was an increase of 14% (95%CI: 5% to 23%) in the proportion of caries-free children (8–12 years) in areas with water fluoridation. | 53,538 (8 observational studies) | ⊕○○○ | A single well-conducted systematic review. The GRADE assessment was downgraded twice for high risk of bias and indirectness (due to lack of contemporary evidence). The authors also upgraded twice for a very large effect size, however GRADE does not allow upgrading if the evidence has already been downgraded. Therefore the quality has been revised. |
| | Significant Increase in proportion of caries-free indigenous children and adolescents (6–15 years) for permanent teeth with exposure to water fluoridation in one study (OR=1.30; 95%CI: 1.01–1.68). Non-significant positive association between water fluoridation and proportion of caries-free 12-year-olds in one study. | >97,809 (2 observational studies) | ⊕○○○ | One acceptable quality study from Australia of indigenous children set in context of CWF. One acceptable study from Brazil using national data. Downgraded for imprecision. |
| Incidence of first molar occlusal caries in permanent teeth | Non-significant decrease in the incidence of first molar occlusal caries at age 13 with exposure to water fluoridation (OR=0.32; 95%CI: 0.10–1.02) | 93,622 (1 observational study) | ⊕○○○ | A single study from US of acceptable quality. Downgraded for imprecision. |

Note: Key to GRADE quality of evidence: ⊕⊕⊕⊕ = We are very confident in the reported associations; ⊕⊕⊕○ = We are moderately confident in the reported associations; ⊕⊕○○ = Our confidence in the reported associations is limited; ⊕○○○ = We are not confident about the reported associations.

Note: We have attempted as far as possible to use the following definitions: infants (0–4 years); children (5–11 years); adolescents (12–17 years); adults (18–64 years) and later adulthood (65+ years)

Abbreviations: dmft/s = number of decayed, missing and filled deciduous teeth/surfaces; dft = number of decayed and filled deciduous teeth; DMFT/S = number of decayed, missing and filled permanent teeth/surfaces; CWF = community water fluoridation; CI = confidence interval; US = United States; NR = not reported

¹ For details of the assessment, please see the individual outcome in the Results section of this report.

Dental caries in mixed dentition

There were no reviews that reported on dental caries of mixed dentition. The studies identified in the systematic review of recent primary studies used the number of decayed, missing and filled teeth of

both deciduous and permanent teeth as a measure of caries (dmft + DMFT). They were all assessed as being of acceptable quality. A combined measure of caries (dmft + DMFT) in mixed dentition is problematic due to the changing numbers of deciduous and permanent teeth over this stage of life (from 5 years to about 12 years) such that the combined measure does not necessarily reflect true caries experience during this period. The summary of findings for these outcomes is presented in Table 3.

The review identified insufficient evidence to reach a conclusion about any association between water fluoridation and caries in mixed dentition.

Table 3 Summary of findings for dental caries in mixed dentition

| Outcomes | Illustrative comparative risks ² (95% CI) | No of participants (studies) | Quality of the evidence (GRADE) ¹ | Comments |
|-------------------------------------|--|------------------------------------|--|---|
| Caries in mixed dentition | Non-significant reduction in caries in one study in infants and children aged 3–12 years Non-significant inverse association between dmft/DMFT and water fluoridation in children aged 6–11 years | 4,784 (2 observational studies) | ⊕○○○ | One study from Australia and another from Canada in the context of CWF. Downgraded for imprecision. |
| Caries incidence in mixed dentition | Non-significant inverse association between incidence of cavitated and non-cavitated caries in mixed dentition and water fluoridation (aged 3–13 years). | 154 (1 observational study) | ⊕○○○ | A single study from the US using Iowa Fluoride Study data. Downgraded for indirectness and imprecision. |

Note: Key to GRADE quality of evidence: ⊕⊕⊕⊕ = We are very confident in the reported associations; ⊕⊕⊕○ = We are moderately confident in the reported associations; ⊕⊕○○ = Our confidence in the reported associations is limited; ⊕○○○ = We are not confident about the reported associations.

Note: We have attempted as far as possible to use the following definitions: infants (0–4 years); children (5–11 years); adolescents (12–17 years); adults (18–64 years) and later adulthood (65+ years)

Abbreviations: dmft/s = number of decayed, missing and filled deciduous teeth/surfaces; dft = number of decayed and filled deciduous teeth; DMFT/S = number of decayed, missing and filled permanent teeth/surfaces; CWF = community water fluoridation; CI = confidence interval; US = United States

¹For details of the assessment, please see the individual outcome in the Results section of this report.

Disparities in dental outcomes

These studies used the difference in a caries measure between levels of socioeconomic status and deprivation or Indigenous status to estimate disparities in dental outcomes. The summary of findings for these outcomes is presented in Table 4.

One review was identified that investigated the effect of water fluoridation on disparities in caries levels. This review scored high on the AMSTAR tool. The studies identified in the systematic review of recent primary studies were of mixed quality: two of acceptable quality and two of low quality.

The review identified insufficient evidence to reach a conclusion about any association between water fluoridation and disparities in dental caries experience.

Table 4 Summary of findings for disparities in dental outcomes

| Outcomes | Illustrative comparative risks* (95% CI) | No of participants (studies) | Quality of the evidence (GRADE) ¹ | Comments |
|--|---|-----------------------------------|--|---|
| Disparities in caries by SES status | There is insufficient information to determine whether initiation of a water fluoridation programme results in a change in disparities in caries levels (deciduous teeth) across SES | >35,399 (3 observational studies) | ⊕○○○ | A single well-conducted systematic review. The GRADE assessment was downgraded once for high risk of bias. The authors reported the quality of evidence as being ⊕⊕○○ and provided no reason why they upgraded. GRADE does not allow upgrading if the evidence has already been downgraded. Therefore the quality has been revised. |
| Disparities in caries by Indigenous status | Water fluoridation increased the gap in proportion caries-free children in deciduous and permanent teeth between Indigenous and non-Indigenous Australians aged 5–15 years | 97,809 (1 observational study) | ⊕○○○ | A single Australian study of low quality in the context of CWF. Downgraded for risk of bias and imprecision. |
| Disparities in caries by deprivation | Water fluoridation had a greater effect in the most deprived subgroup of participants with respect to mean d3mft and caries prevalence in 5-year-olds, mean D3MFT and caries prevalence in 12-year-olds, and hospital admissions for caries of 1 to 4-year-olds compared to the four least deprived subgroups in one study. Difference in D4.6MFT between most and least deprived groups was reduced in areas with fluoridated water for 11 to 13-year-olds in one study. | >1,783 (2 observational studies) | ⊕○○○ | A single large study of acceptable quality from England using a national database setting of CWF. Exploratory analysis of subgroups. No adjustment for confounding. Downgraded for risk of bias and imprecision. Another single large study from the UK downgraded for risk of bias. |

Note: Key to GRADE quality of evidence: ⊕⊕⊕⊕ = We are very confident in the reported associations; ⊕⊕⊕○ = We are moderately confident in the reported associations; ⊕⊕○○ = Our confidence in the reported associations is limited; ⊕○○○ = We are not confident about the reported associations.

Abbreviations: d3mft/ D3MFT = number of decayed (into dentine), missing and filled deciduous/permanent teeth; CWF = community water fluoridation; SES = socioeconomic status; UK = United Kingdom

¹ For details of the assessment, please see the individual outcome in the Results section of this report.

Other dental effects

Other dental effects included tooth loss, delayed eruption of permanent teeth, tooth wear and hospital admissions for caries in children aged 1–4 years. All included studies, except one, were of acceptable quality. The summary of findings for these outcomes is presented in Table 5.

The review identified insufficient evidence that water fluoridation reduces tooth loss or hospital admission for caries. In addition, the review identified limited evidence of no association between water fluoridation and reduced tooth wear and delayed eruption of permanent teeth.

Table 5 Summary of findings for other dental effects

| Outcomes | Illustrative comparative risks* (95% CI) | No of participants (studies) | Quality of the evidence (GRADE) ¹ | Comments |
|---|---|------------------------------------|--|---|
| Number of missing permanent teeth | Four of five studies show lower prevalence of tooth loss with fluoridation of water | >120,625 (5 observational studies) | ⊕○○○ | Downgraded for inconsistency and indirectness. |
| Erupted permanent teeth assessed by clinical examination | No significant difference in mean number of permanent teeth erupted | 13,348 (1 observational study) | ⊕⊕○○ | A single study of acceptable quality from the US with representative sample and adjustment for confounding factors. |
| Delayed eruption of permanent teeth (assessment method NR) | Prevalence of delayed eruption was 53% in 2.7 ppm fluoride area and 0% in 1.0 ppm area | 70 (1 observational study) | ⊕○○○ | A single small, low quality study from India in school children aged 8–15 years with poor reporting of recruitment method and outcome ascertainment, no adjustment for confounding, and no statistical analysis. Set in the context of naturally occurring fluoride in water of up to 2.7 ppm |
| Tooth Wear assessed with modified version of the Smith and Knight index | No consistent association with water fluoridation | 2,456 (1 observational study) | ⊕○○○ | A single study of acceptable quality from the Republic of Ireland. Downgraded in the GRADE assessment for imprecision and inconsistency. |
| Hospital admissions | The rate of hospital admissions for 1 to 4-year-olds was 55% lower in fluoridated areas (95%CI: 73% lower, 27% lower) | NR (1 observational study) | ⊕○○○ | A single population-based study using national admission data from England of acceptable quality in a setting of CWF. Downgraded for imprecision. |

Note: Key to GRADE quality of evidence: ⊕⊕⊕⊕ = We are very confident in the reported associations; ⊕⊕○○ = We are moderately confident in the reported associations; ⊕○○○ = Our confidence in the reported associations is limited; ⊕○○○ = We are not confident about the reported associations.

Abbreviations: dmft/s = number of decayed, missing and filled deciduous tooth/surfaces; dft = number of decayed and filled deciduous teeth; DMFT/S = number of decayed, missing and filled permanent teeth/surfaces; CWF = community water fluoridation; CI = confidence interval; US = United States; NR = not reported; ppm = parts per million

¹ For details of the assessment, please see the individual outcome in the Results section of this report.

Findings of the review of dental fluorosis

The evidence evaluation identified one review which provided consistent evidence that an increase in the fluoride concentration in water supplies is associated with an increase in the prevalence of dental fluorosis. However, the majority of the evidence is derived from countries where naturally occurring fluoride levels are up to five times greater than the levels of fluoride in artificially fluoridated water in Australia. This evidence has limited applicability in the Australian context and is of insufficient quality to predict the prevalence of any dental fluorosis or dental fluorosis of aesthetic concern associated with the current levels of water fluoridation in Australia. This is due to a lack of control for other fluoride sources and marked between-study variation across non-comparable populations. There is also some uncertainty as to what level of dental fluorosis is perceived to be of aesthetic concern. The summary of findings for these outcomes is presented in Table 6.

Table 6 Summary of findings for dental fluorosis

| Outcomes | Illustrative comparative risks* (95% CI) | No of participants (studies) | Quality of the evidence (GRADE) ¹ | Comments |
|---|---|-----------------------------------|--|--|
| Dental fluorosis of aesthetic concern (measured by Dean's Index, TFI, TSIF) | For a fluoride level of 0.7 ppm the percentage of participants with dental fluorosis of aesthetic concern was estimated to be 12% (95% CI 8% to 17%). | 59,630 (40 observational studies) | ⊕○○○ ² | A single well-conducted systematic review. The estimate for any level of dental fluorosis at 0.7 ppm was 40% (95% CI 35% to 44%; 90 studies). This includes dental fluorosis that can only be detected under clinical conditions and other enamel defects. The GRADE assessment has been revised and downgraded for high risk of bias, indirectness and inconsistency. |

Note: Key to GRADE quality of evidence: ⊕⊕⊕⊕ = We are very confident in the reported associations; ⊕⊕⊕○ = We are moderately confident in the reported associations; ⊕⊕○○ = Our confidence in the reported associations is limited; ⊕○○○ = We are not confident about the reported associations.

Abbreviations: CI = confidence interval; ppm = parts per million; TFI = Thystrup-Fejerskov Index; TSIF = Tooth Surface Index of Fluorosis

¹ For details of the assessment, please see the individual outcome in the Results section of this report.

² The quality assessment has been revised—the Iheozor-Ejiofor et al (2015) review reported the quality as ⊕⊕○○ but this should have been downgraded for high risk of bias and inconsistency

Findings of the systematic review of the other health effects of water fluoridation

The systematic review identified 41 relevant primary studies that reported on 23 separate health outcomes. As the studies reported on a wide range of different water fluoride levels, the results for each study were categorised based on the applicability of their comparison to the Australian setting.

Evidence from highly applicable comparisons

The highly applicable comparisons were those that compared unfluoridated water (<0.4 ppm) with water fluoride of between 0.4 ppm and 1.5 ppm. The individual studies that provided highly applicable comparisons were generally of low methodological quality, and many had a high risk of bias. The limitations of the evidence have affected the ability to draw conclusions from the available information. The summary of findings from these comparisons is presented in Table 7.

The review identified evidence that there is no association between water fluoridation at Australian levels and the IQ of both adults and children, compared to unfluoridated water. We have moderate confidence in this assessment because of the high methodological quality of the prospective cohort study and the high similarity between the Australian setting and New Zealand, where the study was conducted.

The review identified limited evidence of no association between water fluoridation at Australian levels and the outcomes of delayed tooth eruption, tooth wear, osteosarcoma, Ewing sarcoma, total cancer incidence, hip fracture and Down syndrome. However, our confidence in these assessments is limited due to the methodological shortcomings of the individual studies. The review also identified limited evidence suggesting that water fluoridation at Australian levels is associated with a small reduction in all-cause mortality; however, our confidence in this association is limited, and the size of the effect was small and may be due to chance.

The review included five outcomes where the available evidence was considered insufficient to draw any conclusions. Those outcomes were kidney stones, chronic kidney disease, gastric discomfort, headache, and insomnia.

Table 7 Summary of findings for other health outcomes with highly applicable fluoride level comparisons

| Outcomes | Illustrative comparative risks* (95% CI) | No of participants (studies) | Quality of the evidence (GRADE) ¹ | Comments |
|--|--|--|--|---|
| All-cause mortality assessed using official mortality statistics | Adjusted incidence was 1.3% lower in areas with CWF (95%CI: 2.5% lower to 0.1% lower) | 208,570,962 person-years at risk (1 observational study) | ⊕⊕○○ | A single large study of acceptable quality from England using a national database with adjustment for confounders in a setting of CWF. |
| Osteosarcoma assessed using official mortality statistics | No statistically significant difference in incidence of osteosarcoma between areas with water fluoridation and those without | 519,128,941 person-years at risk (5 observational studies) | ⊕⊕○○ | Four of these studies were large population-based studies from countries with CWF all assessed as being of acceptable methodological quality. The fifth study was a population-based study of national statistics that reported only crude incidence rates. |
| Osteosarcoma (assessment method NR) | Participants with osteosarcoma lived in areas with higher fluoride water levels than people without osteosarcoma (1.30 ppm vs. 0.48 ppm) | 20 (1 observational study) | ⊕○○○ | A single very small case-control study from India of low methodological quality (high risk of bias) with no information about participant demographics, recruitment, assessment of disease status, or the presence of potential confounding factors. |
| Ewing sarcoma assessed using national cancer registries | No significant increase in the risk of Ewing sarcoma with increasing fluoride level | 992,213 person-years at risk (1 observational study) | ⊕⊕○○ | A single population-based study using national cancer registries from England of acceptable quality in a setting of CWF |
| All cancer incidence assessed using a national cancer register | Adjusted incidence of all cancer was 0.4% lower in areas with CWF (95%CI: 1.2% lower to 0.4% higher) | 208,570,962 person-years at risk (1 observational study) | ⊕⊕○○ | A single population-based study using national cancer register from England of acceptable quality in a setting of CWF |
| Bladder Cancer assessed using a national cancer register | Adjusted bladder cancer incidence was 8.0% lower in areas with CWF (95%CI: 9.9% lower to 6.0% lower) | 555,127,448 person-years at risk (1 observational study) | ⊕⊕○○ | Single population-based study using a national cancer register from England of acceptable quality in a setting of CWF. |
| Eye Cancer assessed using a national cancer register | Negative correlation between incidence of eye cancer and water fluoride level | NR (1 observational study) | ⊕⊕○○ | A single acceptable quality study of the correlation between the proportion of the population each US state exposed to CWF with eye cancer incidence |
| Hip Fracture assessed by national hospital statistics | Effect estimates from both studies found no statistically significant difference in the incidence of hip fracture. | 313,045,314 person-years at risk (2 observational studies) | ⊕⊕○○ | Two population-based studies from Sweden and England of methodologically acceptable quality. |
| Down Syndrome assessed using a national register | Incidence of Down syndrome births were 0.9% higher (95%CI: 0.8% lower to 2.6% higher) in areas with CWF | 2,727,330 person-years at risk (1 observational study) | ⊕⊕○○ | A single population-based study of methodologically acceptable quality from England in the setting of CWF |

| Outcomes | Illustrative comparative risks* (95% CI) | No of participants (studies) | Quality of the evidence (GRADE) ¹ | Comments |
|---|--|--|--|---|
| IQ assessed using Wechsler Intelligence Scales | No significant difference in IQ scores between people exposed to CWF compared to those not exposed | 1,037 (1 observational study) | ⊕⊕⊕○ | A longitudinal population-based study of high methodological quality from New Zealand with all major fluoride intakes considered and confounders adjusted for in a setting of CWF. |
| Kidney Stones assessed with national hospital statistics | Incidence of emergency admissions for kidney stones was 7.9% lower (95%CI: 9.6% lower to 6.2% lower) in the areas with CWF | 312,856,448 person-years at risk (1 observational study) | ⊕⊕○○ | A population-based study of methodologically acceptable quality from England in a setting of CWF. |
| Chronic kidney disease assessed using existing prevalence studies | Prevalence of chronic kidney disease of unknown aetiology in the three villages was 96%, 0%, and 84% | 5,685 (1 observational study) | ⊕○○○ | A single study from Sri Lanka of low methodological quality (high risk of bias) in three villages with mean water fluoride levels of 0.74, 1.03, and 1.02 ppm, respectively. No trend was observed. |
| Gastric Discomfort assessed with self-report health survey | Prevalence was higher in the 0.4–1.5 ppm area adults but not for children | 3,764 (2 observational studies) | ⊕○○○ | Two studies from India of low methodological quality (high risk of bias) in setting of naturally occurring fluoride. No statistical analysis. |
| Headache assessed by self-report health survey | Prevalence was higher in the 0.4–1.5 ppm area adults but not for children | 3,283 (2 observational studies) | ⊕○○○ | Two studies from India of low methodological quality (high risk of bias) in setting of naturally occurring fluoride. No statistical analysis. |
| Insomnia assessed by self-report health survey | Prevalence was higher in the 0.4–1.5 ppm area adults but not for children | 3,283 (2 observational studies) | ⊕○○○ | Two studies from India of low methodological quality (high risk of bias) in setting of naturally occurring fluoride. No statistical analysis. |

Note: Key to GRADE quality of evidence: ⊕⊕⊕⊕ = We are very confident in the reported associations; ⊕⊕⊕○ = We are moderately confident in the reported associations; ⊕⊕○○ = Our confidence in the reported associations is limited; ⊕○○○ = We are not confident about the reported associations.

Abbreviations: CI = confidence interval; CWF = community water fluoridation; IQ = intelligence quotient; ppm = parts per million; US = United States; NR = not reported

¹For details of the assessment, please see the individual outcome in the Results section of this report.

Evidence from partially applicable comparisons

Studies categorised as partially applicable included those that compared unfluoridated water to water containing >1.5 ppm fluoride; and those that compared water with 0.4–1.5 ppm fluoride to water with >1.5 ppm fluoride. The summary of findings from these comparisons is presented in Table 8.

The review found limited evidence of no association between higher levels of fluoride (>1.5 ppm) and the risk of hip fracture. Our confidence in this assessment is moderate, due to the acceptable methodological quality of the study and the low risk of bias in the study estimates. For all other outcomes, the quantity and quality of the evidence were insufficient to allow any conclusions to be drawn.

Table 8 Summary of findings for other health outcomes with partially applicable fluoride level comparisons

| Outcomes | Illustrative comparative risks* (95% CI) | No of participants (studies) | Quality of the evidence (GRADE)† | Comments |
|---|--|---|----------------------------------|--|
| Atherosclerosis assessed by carotid ultrasound | Higher prevalence in areas with fluoride levels >1.20 ppm | 585 (1 observational study) | ⊕○○○ | A single study in adults >40 years from China of acceptable quality in the context of high naturally occurring water fluoride levels. Important known confounders not included in analysis e.g. smoking, exercise, diabetes |
| Hypertension assessed by sphygmomanometer | Conflicting results from the two continuous analyses Significantly higher odds of hypertension for ≥3.01 ppm fluoride compared to ≤1.20 ppm fluoride exposure only (all other comparisons between intermediate levels and lowest level not significant) | NR (2 observational studies) 487 (1 observational study) | ⊕○○○ | Two studies of low methodological quality from Iran using regression analysis to investigate a correlation between prevalence of hypertension and water fluoride levels (range 0.02–2.2 ppm). Single small study of adults 40–75 years from China of acceptable methodological quality found only significant raised odds with ≥3.01 ppm fluoride compared to lowest comparator (≤1.20 ppm) |
| Hip Fracture assessed by national hospital statistics | Hazard ratio = 0.98 (95%CI: 0.93–1.04) | 13,736 person-years at risk (1 observational study) | ⊕⊕⊕○ | One population-based study from Sweden of methodologically acceptable quality. |
| Osteoporosis assessed by x-ray | Prevalence of osteoporosis: 6.2% with 1.5–7.0 ppm exposure 6.8% with 0.5–1.0 ppm exposure | 675 (1 observational study) | ⊕○○○ | A single study in adults from China of low methodological quality with poor reporting of selection method, no consideration of known confounding factors, the uncertain accuracy of diagnosis, and no statistical analysis. |
| Birth weight assessed with baby scale | Increased odds of low birth weight associated with exposure to high fluoride levels (4.7 ppm) | 324 (1 observational study) | ⊕○○○ | A single study from Africa of low methodological quality in a setting of high naturally occurring fluoride levels (4.7 ppm). |
| IQ and cognitive function assessed with various instruments | 11 of 13 analyses reported a significantly lower IQ score with high fluoride levels (range 2.3–9.2 ppm) No association between fluoride water levels and cognitive performance in one analysis | 1,565 (11 observational studies) | ⊕○○○ | Nine studies from China, Iran, and India were of low methodological quality (high risk of bias) due to poor recruitment reporting, no consideration of confounding factors, and no blinding of outcome assessors. One study from Mexico and another from China were of acceptable quality. |
| Thyroid function assessed with thyroid function tests | All thyroid function tests within reference range | 240 (2 observational studies) | ⊕○○○ | Two studies of low methodological quality from India and China of school children in areas with high naturally-occurring levels of fluoride in water. |

| Outcomes | Illustrative comparative risks* (95% CI) | No of participants (studies) | Quality of the evidence (GRADE) ¹ | Comments |
|--|--|---------------------------------|--|---|
| Thyroid volume assessed with ultrasound | Thyroid volumes were inconsistent using two measures of thyroid volume | 559 (1 observational study) | ⊕○○○ | A single study from Iran in schoolchildren of low quality found no difference in thyroid volume but a significant difference in Echobody index. The clinical validity of this measure and its implications are unclear. |
| Musculoskeletal pain assessed with self-report health survey | Odds of lower back pain significantly greater in the high fluoride area. Prevalence of joint pain higher in the high fluoride area. | 3,266 (2 observational studies) | ⊕○○○ | One small study of low quality (high risk of bias) from India and a single study from Thailand of low methodological quality in adults 50–90 years. |
| Gastric discomfort assessed with self-report health survey | Higher prevalence of complaints of gastric discomfort in >1.5 ppm fluoride exposed group | 2,814 (2 observational studies) | ⊕○○○ | Two studies of adults and children in India of low methodological quality. No statistical analysis was done. |
| Headache assessed by self-report health survey | Higher prevalence in >1.5 ppm fluoride group | 2,937 (2 observational studies) | ⊕○○○ | Two studies from India of low methodological quality (high risk of bias) in setting of naturally occurring fluoride. No statistical analysis. |
| Insomnia assessed by self-report health survey | Higher prevalence in >1.5 ppm fluoride group | 2,937 (2 observational studies) | ⊕○○○ | Two studies from India of low methodological quality (high risk of bias) in setting of naturally occurring fluoride. No statistical analysis. |

Note: Key to GRADE quality of evidence: ⊕⊕⊕⊕ = We are very confident in the reported associations; ⊕⊕○○ = We are moderately confident in the reported associations; ⊕○○○ = Our confidence in the reported associations is limited; ⊕○○○ = We are not confident about the reported associations.

Abbreviations: CI = confidence interval; IQ = intelligence quotient; NR = not reported; ppm = parts per million

¹ For details of the assessment please see the individual outcome in the Results section of this report.

Evidence from low applicability comparisons

Low applicability comparisons compared groups that all had water fluoride levels >1.5 ppm. The summary of findings from these comparisons is presented in Table 9. The evidence for all outcomes was insufficient to draw any conclusions about the differential effect of multiple high water fluoride levels.

Table 9 Summary of findings for other health outcomes with limited applicability in fluoride level comparisons

| Outcomes | Illustrative comparative risks* (95% CI) | No of participants (studies) | Quality of the evidence (GRADE) ¹ | Comments |
|--|---|---------------------------------|--|--|
| Atherosclerosis assessed by carotid ultrasound | No significant difference in prevalence | 399 (1 observational study) | ⊕○○○ | A single acceptable quality study from China in adults >40 years in the context of high naturally occurring fluoride levels. All comparisons were >1.21 ppm. |
| Skeletal fluorosis (assessment NR) | Skeletal fluorosis prevalence (range): grade II: 4.7% to 20.1%; grade III: 0% to 3.9% | 2,816 (2 observational studies) | ⊕○○○ | Two low quality prevalence studies from India in the setting of naturally occurring fluoride levels from 1.5 ppm to >6.0 ppm. The diagnostic method was not reported and no statistical analysis was done. |

| Outcomes | Illustrative comparative risks* (95% CI) | No of participants (studies) | Quality of the evidence (GRADE) ¹ | Comments |
|---|---|-------------------------------|--|---|
| IQ assessed with various IQ instruments | One of two studies reported statistically significant lower IQ score in high fluoride group | 392 (2 observational studies) | ⊕○○○ | Two low quality studies from India and Iran of schoolchildren 6–13 years old from villages with drinking water fluoride levels of 2–3 ppm and >5 ppm, respectively. |

Note: Key to GRADE quality of evidence; ⊕⊕⊕⊕ = We are very confident in the reported associations; ⊕⊕⊕○ = We are moderately confident in the reported associations; ⊕⊕○○ = Our confidence in the reported associations is limited; ⊕○○○ = We are not confident about the reported associations.

Abbreviations: CI = confidence interval; IQ = intelligence quotient; NR = not reported; ppm = parts per million

¹ For details of the assessment please see the individual outcome in the Results section of this report.

QUALITY OF THE EVIDENCE

Overall, the quality of the evidence for dental outcomes was low or very low. This was largely due to the limitations of observational studies, however restricting the inclusion to studies which adjusted for known confounding factors resulted in most of the included studies for caries being assessed as of acceptable quality. Any individual studies assessed as being of low quality were generally considered to be at risk of selection bias.

Overall, the quality of evidence across all of the other health outcomes was low or very low. This is primarily due to the poor methodological quality of the included studies, which results in a high risk of bias. In many studies, the quality of the reporting of both study methods and results was very poor. Many studies also have small numbers of participants, which undermines the ability of the study to detect meaningful differences in health outcomes. The majority of the included studies made only a rudimentary assessment of the fluoride exposures and did not include any adjustment in their analyses for the effects of potential confounding variables. The lack of adjustment for confounding variables has seriously limited the ability of this review to draw conclusions from the majority of the results identified.

CONCLUSIONS

The evidence collected in this review supports the findings of the previous NHMRC review (2007), that water fluoridation at levels comparable to those used in Australia reduces the incidence of dental caries in the deciduous and permanent teeth of children by approximately 35%², compared to unfluoridated water. Water fluoridation also increases the proportion of children who have no dental caries by approximately 15%³. Fluoridation of water at levels comparable to that used in Australia increases the prevalence of dental fluorosis. The prevalence of dental fluorosis of aesthetic concern was estimated to be 12%⁴ for 0.7 ppm fluoride. These estimates are largely consistent with the evidence collected from the other included reviews and the systematic review of recent primary studies.

There is limited evidence that there is no association between water fluoridation at Australian levels and the IQ of children and adults. There is also limited evidence that there is no association between water fluoridation at Australian levels and the outcomes of delayed tooth eruption, tooth wear, osteosarcoma, Ewing sarcoma, total cancer incidence, hip fracture and Down syndrome. The review also identified evidence suggesting that water fluoridation at Australian levels are associated with a small reduction in all-cause mortality, however, our confidence in this association is limited, and this small reduction may be due to chance. For all other outcomes canvassed in this review, the evidence was of insufficient quality to draw any conclusions.

² Illustrative proportion from Iheozor-Ejirofor et al (2015)

³ Illustrative proportion from Iheozor-Ejirofor et al (2015)

⁴ Illustrative proportion from Iheozor-Ejirofor et al (2015)

Taken together, the evidence in this review indicates that water fluoridation, as implemented in Australia, improves the dental health of children and adults. There is evidence that water fluoridation increases the number of people who experience dental fluorosis but does not appear to be associated with any other significant harm. This evidence has limited applicability in the Australian context and is of insufficient quality to predict the prevalence of any dental fluorosis or dental fluorosis of aesthetic concern associated with the current levels of water fluoridation in Australia. There is also some uncertainty as to what level of dental fluorosis is perceived to be of aesthetic concern.

The evidence available to assess the effects of water fluoridation will likely always come from observational studies, some of which will be of low methodological quality. Decision-makers must recognise these limitations and be prepared to make pragmatic decisions based on the best available evidence about the implementation and maintenance of water fluoridation programs in Australia.

INTRODUCTION

BACKGROUND INFORMATION

Fluoride and dental caries

Dental caries is a chronic and progressive disease of the mineralised and soft tissues of the teeth. It has a multifactorial aetiology related to interactions between tooth substance, certain acid-producing bacteria and dietary carbohydrates. Acids produced during the metabolism of carbohydrates by oral bacteria cause the demineralisation of the tooth enamel and without treatment this can extend into the dentine and the dental pulp (Cate & Featherstone 1991). Dental caries is a major public health problem in most industrialised countries, affecting 60% to 90% of school children (Petersen 2003).

Fluoride has three predominant mechanisms of action to prevent dental caries: inhibiting demineralisation of tooth enamel during attack by acid-producing plaque bacteria, enhancing the early remineralisation of enamel lesions, and inhibiting bacterial metabolism (Featherstone 2000; Robinson 2009). Even though the predominant effect is topical, fluoride incorporated into tooth enamel pre-eruption also has a role (Singh et al 2003; Singh et al 2007). The concentration of fluoride in saliva and plaque liquid is raised by drinking water containing fluoride or brushing teeth with fluoridated toothpaste. When water containing fluoride is ingested, fluoride is absorbed and secreted back into saliva, where it can act to inhibit enamel demineralisation. In addition, ingested fluoride is incorporated into the developing enamel in pre-erupted teeth, making those teeth more resistant to decay (RSNZ 2014).

Intentional water fluoridation

Water fluoridation is the intentional addition of a fluoride compound to a public water supply so that the level of fluoride in the water reaches an optimal level that balances the prevention of dental caries with the avoidance of dental fluorosis. The concentration of fluoride in water is most commonly measured in parts per million (ppm), which is equivalent to mg/L. Fluoridation of public water supplies began in the 1940s in the United States after epidemiological studies were published that showed that populations with high levels of naturally occurring fluoride in their water supply had a reduced prevalence of dental caries (RSNZ 2014).

In Australia, naturally-occurring fluoride levels in water are generally very low at <0.1 ppm and fluoride has been added to water artificially for more than 55 years (AIHW 2012). Water fluoridation of a public water supply in Australia first occurred in Beaconsfield, near Launceston, Tasmania in 1953 (NHMRC 2007a). Subsequently all state and territory capitals have implemented water fluoridation, including Brisbane in 2009. The number of people with access to fluoridated water increased from around 11.7 million in 2002 to 17.6 million in 2009 (British Fluoridation Society 2004). Percentages of the resident population that have access to fluoridated public water supplies, by state or territory as at August 2013⁵ is as follows:

- Australian Capital Territory (100%)
- New South Wales (96%)
- Queensland (80%)
- Western Australia (92%)
- South Australia (90%)
- Victoria (90%)
- Tasmania (83%)
- Northern Territory (70%)

The World Health Organization has concluded that water fluoridation is a safe and cost-effective way to prevent dental decay (Petersen 2008; WHO 2006). This conclusion is supported by the

⁵ Sourced from data from jurisdictional health authorities in August 2013 and published by NSW Health

findings of a number of studies of cost-effectiveness from different jurisdictions. A study assessing the cost savings resulting from water fluoridation in the US found that the reduction in costs of restorative treatment due to averted dental decay exceeded the cost of water fluoridation (Griffin et al 2001). A study from New Zealand concluded that fluoridation was cost-effective, especially for communities with high proportions of children, indigenous people or people of low socioeconomic status (Wright et al 2001). Two recent Australian studies have shown that for every dollar spent on fluoridation, between \$7 and \$18 is saved due to avoided treatment costs (Ciketic et al 2010; Cobiac & Vos 2012). Finally, another Australian economic study found that over 25 years, water fluoridation had saved the state of Victoria about \$1 billion through avoided dental costs, days away from work or school and other costs (Department of Health Victoria 2009)

Trends in caries in Australia

In Australia, there has been a drop in the number of decayed, missing, or filled deciduous teeth in 6-year-old children from an average of 3.13 in 1977 to 1.45 in 1996. There has, however, been a gradual rise since 1996 to around an average of 2.5 teeth affected. The trend has been similar for permanent teeth at age 12 which decreased from an average of 4.79 permanent teeth affected by dental caries in 1977 to less than 1 tooth affected in 1998, with an increase to more than 1 in 2010 (AHIW 2014). In adults there has been also a trend of decreasing caries experience, with national surveys reporting a fall in the average number of teeth affected by decay from nearly 15 teeth in 1987–88 to around 13 teeth in 2004–6. This decrease was a result of a decrease in both the average number of teeth with untreated decay and the average number of teeth missing as a result of decay (AHIW 2014).

Potential adverse effects of water fluoridation

One known adverse effect associated with the use of fluoride is dental fluorosis. Dental fluorosis is due to excess fluoride ingestion by young children during tooth formation. This causes hypomineralisation of tooth enamel and shows up as differences in enamel opacity (DenBesen and Li 2011). The appearance of the teeth depends on the severity of the fluorosis. In its mild form there are faint white spots or lines; moderate fluorosis appears as mottling of the teeth with opaque white patches; in severe fluorosis there is brown staining or pitting of the enamel (Rozier 1994). Dental fluorosis associated with water fluoridation is usually graded as mild or less, which affects the appearance of teeth but is not of clinical or aesthetic concern (NFIS 2011).

Another known adverse effect is skeletal fluorosis which is a condition where there is an excessive amount of fluoride incorporated into bone. Symptoms include bone pain, joint stiffness, and other arthritic symptoms. It occurs in individuals exposed to excessively high levels of fluoride, and is endemic in several parts of the world including India, China, parts of the Middle East and Africa, where water supplies have fluoride levels much greater than that used for community water fluoridation (CWF) in Australia. It is extremely rare in the developed world (British Fluoridation Society 2004).

Fluoride levels used in Australia

In 2007, the National Health and Medical Research Council (NHMRC) published *A Systematic Review of the Efficacy and Safety of Fluoridation* (NHMRC 2007a). Based on the findings presented in the review, NHMRC issued a public statement that recommended "that water be fluoridated in the target range of 0.6 to 1.1 mg/L, depending on climate, to balance reduction of dental caries and occurrence of dental fluorosis" (NHMRC 2007b). The 2011 *Australian Drinking Water Guidelines* developed by NHMRC in collaboration with the Natural Resource Management Ministerial Council recommended that, based on health considerations (namely to protect children from the risk of dental fluorosis), the concentration of fluoride in drinking water should not exceed 1.5 mg/L (NHMRC 2011). The Australian Fluoride Guidelines which were updated at a workshop of the Australian Research Centre for Population Oral Health (ARCPOH) in 2012 recommended the continuation of water fluoridation in Australia, in addition to the extension to as many people as possible living in non-fluoridated areas, within the range of 0.6 ppm to 1.1 ppm with a variation within that range according to the mean maximum daily temperature (ARCPOH 2012).

PURPOSE OF THIS REVIEW

Controversy around water fluoridation in Australia sometimes arises due to concerns focussed on ethical issues or possible harmful effects of fluoride. The purpose of this evidence evaluation is to update the evidence on the health effects of water fluoridation from NHMRC's 2007 review to assist NHMRC to provide evidence based guidance on the benefits and harms of water fluoridation.

The evidence evaluation focuses on the effects of fluoride in drinking water and will not consider other sources of fluoride, including topical fluoride, fluoridated milk or salt and fluoride in infant formula. Outside of the scope of the review is consideration of the specific chemicals used to fluoridate water and the impact of consuming bottled water or juice in place of fluoridated water. The review will not include a formal cost-benefit analysis for water fluoridation and will not recommend any particular range of concentrations for fluoridation.