DATE: Thursday, October 13, 2016
TIME: 8:30 AM – 9:30 AM
LOCATION: Regional Council Chamber, 5th Floor
Regional Administrative Headquarters
10 Peel Centre Drive, Suite A
Brampton, Ontario

MEMBERS: F. Dale; J. Downey; A. Groves; M. Palleschi; C. Parrish; K. Ras; J. Sprovieri; J. Tovey

Chaired by Councillor C. Parrish or Vice-Chair Councillor J. Sprovieri

1. DECLARATIONS OF CONFLICTS OF INTEREST

2. APPROVAL OF AGENDA

3. INVITED DELEGATES
3.1. Dr. Shusheela, Executive Director, India’s Fluorosis Research and Rural Development Foundation, Invited to Present her Findings on Fluoride and Fluorosis and Its Effects on Human Health (See also Items Related to Communications – Item 5.3)

4. REPORTS
4.1. Updated Review of Evidence on the Effectiveness and Safety of Community Water Fluoridation (For information)
   Presentation by Dr. E. de Villa, Medical Officer of Health

5. COMMUNICATIONS
5.1. David Green, President, Rocky Ridge Drinking Water Limited, Letter received June 22, 2016, Regarding the Use of Hydrofluorosilicic Acid (HFSA) in Drinking Water (Receipt recommended)
5.2. **Dr. Sanjukta Mohanta, Dentist, Wellfort Community Health Centre**, Letter dated July 4, 2016, Regarding the Benefits of Water Fluoridation (Receipt recommended)

5.3. **Liesa Cianchino, Chair, Concerned Residents of Peel to End Fluoridation**, E-mail dated September 22, 2016, Requesting that Dr. A.K. Susheela, Executive Director of India's Fluorosis Research and Rural Development Foundation, be Invited to Delegate (Receipt recommended) (See also Invited Delegates - Item 3.1)

6. **OTHER BUSINESS**

7. **IN CAMERA MATTERS**

8. **NEXT MEETING**

   Thursday, November 24, 2016, 8:30 a.m. - 9:30 a.m.
   Regional Council Chamber, 5th Floor
   Regional Administrative Headquarters
   10 Peel Centre Drive, Suite A
   Brampton, Ontario

9. **ADJOURNMENT**
DATE: October 03, 2016

REPORT TITLE: UPDATED REVIEW OF EVIDENCE ON THE EFFECTIVENESS AND SAFETY OF COMMUNITY WATER FLUORIDATION

FROM: Janette Smith, Commissioner of Health Services
Eileen de Villa, MD MBA MHSc CCFP FRCPC
Medical Officer of Health

OBJECTIVE

The objective of this report is to present findings from research evidence and community water fluoridation (CWF) decisions across Ontario.

REPORT HIGHLIGHTS

- Peel Public Health utilizes a systematic and objective process to review research evidence on all matters of public health significance, including the effectiveness and safety of community water fluoridation (CWF).
- A review of the research evidence on CWF found the following:
  - Effectiveness: Statistically significant reductions in rates and severity of tooth decay in children and adults.
  - Dental Fluorosis: A small increased risk of fluorosis of aesthetic concern.
  - Safety: The evidence does not support a link between fluoride in drinking water at the optimal concentration of 0.7mg/L and any adverse health effects.
- In Ontario, the most recent estimate indicates that approximately 67.3 per cent of the population lives in a community with a fluoridated water system.
- CWF decisions are made at the local level and may be influenced by various matters such as technical feasibility, financial considerations, and resident/community input. The spectrum of CWF decisions may range from starting CWF, maintaining the practice, changing the fluoridation additive that is used, discontinuing or not starting CWF.
- As directed by Council in 2012 and aligned with a commitment to evidence-informed decision making, Peel Public Health will continually monitor the scientific literature on fluoridation and advise of any changes to the evidence base.

DISCUSSION

1. Background

In May 2012, Council directed the Medical Officer of Health to monitor the scientific literature on community water fluoridation (CWF) and advise of any changes to the evidence base. In April 2014, a review of the published evidence was conducted and provided to Council.
In March 2016, the Community Water Fluoridation Committee endorsed a work plan that requested staff to bring forward high quality and relevant research evidence to inform discussions. As per direction, an updated review of the evidence was conducted, and supplemented with a scan of the practice of CWF across Ontario.

2. Monitoring and Reviewing Evidence

There is extensive published literature on the subject of water fluoridation; however, the literature varies in design and quality, and the findings may not always be relevant to the context of Peel where CWF is practiced within the optimal concentration range (0.5 – 0.8 mg/L) to protect against tooth decay. Peel Public Health (PPH) utilizes a systematic and objective process to review research evidence on all matters of public health significance, including the effectiveness and safety of CWF. This process involves a series of predetermined, replicable, and transparent steps. In summary, these steps include:

- comprehensive searches of electronic databases by a trained librarian - to ensure any and all published evidence is identified;
- the systematic and explicit application of relevance criteria to the identified studies;
- critical appraisal of relevant studies using validated tools; and
- two independent reviewers conducting all the review procedures (including screening citations, data abstraction and critical appraisal).

3. Scope of Review

a) Nature of Evidence

The current evidence review investigates the relationship between CWF with fluoride concentrations within the range of 0.5-1.2 mg/L and any potential health effects. As a result of assessing health effects at this range, toxicological studies are not within scope of this nature of evidence review. Generally, most toxicological studies in animal models involve examining impacts at exposures much higher than the community exposure associated with fluoridation of drinking water.

Relevant toxicological and epidemiological studies are considered by Health Canada as part of the development of the Guidelines for Canadian Drinking Water Quality, and referenced within the technical document. Health Canada conducts the health risk assessments through a weight-of-evidence approach, using credible scientific studies published in recognized peer-reviewed journals. Guidelines are developed 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). 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. According to Health Canada's Guidelines for Canadian Drinking Water Quality: Guideline Technical Document - Fluoride, “the Maximum Acceptable Concentration for fluoride (1.5 mg/L) was established based on the segment of the population most at risk of developing dental fluorosis, children 1-4 years old”. Health Canada also takes total fluoride consumption from all sources into consideration when developing such guidelines.
b) Water Fluoridation Additive – Specific Studies

Concerns related to specific fluoridation additives are not directly addressed in the review. NSF International, an independent accredited global organization, administers the testing and certification of additives, and develops standards in consideration of the relative risk of products for human health. Full disclosure of each residual detected in the additive tested is mandatory under the standard, and a toxicological evaluation is required to determine if the concentrations of any detected residuals have the potential to cause adverse human health effects. The standard also requires NSF International to confirm through testing that any residuals in the water due to fluoridation additives remain well below allowable thresholds (i.e. less than 10 per cent of allowable levels).

c) Randomized Controlled Trials

Members of Council have also questioned the lack of randomized control trials on CWF. Research experts have confirmed that the nature of the research question makes randomized control trials unfeasible. Such trials would require a group of people who have never been exposed to CWF in the past to ensure past exposure did not introduce bias. There are ethical concerns regarding allocation of individuals to the non-fluoridated group given documented evidence of effectiveness. Furthermore, to ensure a quality randomized control trial, 100 per cent of the water consumed would need to be provided by the research team and the required length of observation would be a significant obstacle in the feasibility and cost of conducting such a study.

4. Evidence Review Results

The evidence review (Appendix I) summarizes findings from research in the following three areas: effectiveness, dental fluorosis, and safety.

a) Effectiveness

- Two systematic reviews (total of 50 single studies) reported beneficial effects when comparing children living in fluoridated and low/non-fluoridated communities. When comparing children living in fluoridated (0.5-1.2 parts per million [ppm]) to low/non-fluoridated (<0.4 ppm) areas findings included:
  - 35 per cent reduction in cavities in baby teeth (pooling of nine studies = 44,268 children)
  - 26 per cent reduction in cavities in permanent teeth (pooling of 10 studies = 78,764 children)
  - 15 per cent increase in children with no cavities (pooling of 18 studies = 93,504 children)

- Two recent, strong quality single studies assessed equity and both found the benefits of CWF to be equally distributed across socioeconomic groups, with some benefits being more pronounced in children of low income families.
b) Dental Fluorosis

- One systematic review of 40 studies (59,630 children) reported that in a community where water is fluoridated to 0.7 ppm, an estimated 12 per cent of children would be expected to have fluorosis of aesthetic concern; at a water fluoride level of 0.1 ppm, eight per cent of children would have fluorosis of aesthetic concern.
- A recent, strong quality single study reported 45 per cent of children in the fluoridated community had fluorosis (of any level) versus 27 per cent of children living in the non-fluoridated area.

c) Safety

- One systematic review of 30 studies and six strong single studies reported on safety. Across these studies, 19 safety outcomes were assessed: cancer of all causes, thyroid cancer, bone 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.
- Studies assessing the safety of CWF do not support a link between fluoride in drinking water at the optimal concentration (0.7mg/L) and any adverse health effects.

5. Community Water Fluoridation Across Ontario

Currently, there is no national-level coordination to monitor and report on community water fluoridation. In Ontario, the most recent estimate indicates that approximately 67.3 per cent of the population lives in a community with a fluoridated water system. Consultation with the Ministry of the Environment and Climate Change indicates that as of January 11, 2016, approximately 75 municipal residential drinking water systems in Ontario fluoridate the water. Since 2010, some drinking water systems have discontinued fluoridation and one drinking water system has added fluoridation.

Discontinued
- Huntsville (Fairyview) Drinking Water System, District Municipality of Muskoka
- Birch Glen (Baysville) Drinking Water System, District Municipality of Muskoka
- City of Windsor Drinking Water System, City of Windsor
- Amherstburg Drinking Water System, Town of Amherstburg
- Kirkland Lake Drinking Water System, Town of Kirkland Lake
- Town of Lakeshore Drinking Water System - Stoney Point, Town of Lakeshore
- Region of Waterloo Drinking Water System – Waterloo, Regional Municipality of Waterloo
- Parry Sound Drinking Water System, Town of Parry Sound
- Nairn Centre Drinking Water System, Township of Nairn and Hyman
- City of Cornwall (decision pending)

Added
- Port Severn (Lone Pine) Drinking Water System, District Municipality of Muskoka
The Ministry of the Environment and Climate Change does not record the rationale for these decisions as these are typically multi-faceted and made at the local level. In general, there are three types of decisions made related to community water fluoridation:

- Start or not-start CWF;
- Discontinue or maintain/continue CWF; and
- Change the fluoridation additive.

The rationale for these decisions varies by jurisdiction and may be influenced by internal and external factors, such as consideration of health effects, technical/financial aspects related to the delivery of fluoride, cost of infrastructure and/or fluoride additives, and resident/community input. In addition to the jurisdictions choosing to discontinue CWF indicated above, the following are a few examples of jurisdictions that have made other decisions related to CWF:

<table>
<thead>
<tr>
<th>Not start</th>
<th>Maintain/Continue Fluoridation</th>
<th>Change of Fluoridation Additive*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Town of Kingsville</td>
<td>City of Toronto, City of Hamilton, Region of Halton, City of London, Town of Bracebridge</td>
<td>City of Toronto, Region of Durham, Region of Norfolk, Smiths Falls</td>
</tr>
</tbody>
</table>

* The above mentioned are examples of jurisdictions that have changed to a hydrofluorosilicic acid additive derived from calcium fluoride.

**CONCLUSION**

A current review of evidence finds that children and adults living in fluoridated communities have lower levels and severity of tooth decay than those living in low/non-fluoridated communities. The risk of dental fluorosis is slightly higher in fluoridated communities; however, only a small portion of people experience fluorosis of aesthetic concern. Studies assessing the safety of CWF do not support a link between fluoride in drinking water at the optimal concentration (0.7 mg/L) and any adverse health effects.

Jurisdictions across Ontario continue to make decisions on CWF. Over 70 municipal residential drinking water systems in Ontario fluoridate the water. Since 2010, some drinking water systems have discontinued fluoridation and one drinking water system has added fluoridation. A few jurisdictions have changed their fluoridation additive to a hydrofluorosilicic acid additive derived from calcium fluoride.
As directed by Council in 2012 and aligned with a commitment to evidence-informed decision making, Peel Public Health will continually monitor the scientific literature on fluoridation and advise of any changes to the evidence base.

Janette Smith, Commissioner of Health Services

Eileen de Villa, MD MBA MHSc CCFP FRCPC
Medical Officer of Health

Approved for Submission:

D. Szwarc, Chief Administrative Officer

APPENDICES

Appendix I: Summary of Research Evidence Reviewed
Appendix II: References

For further information regarding this report, please contact Olha Dobush, Director, Chronic Disease and Injury Prevention ext. 2617.

Authored By: Sharanjeet Kaur, Manager, Chronic Disease and Injury Prevention
## APPENDIX I
### UPDATED REVIEW OF EVIDENCE ON THE EFFECTIVENESS AND SAFETY OF COMMUNITY WATER FLUORIDATION

#### Summary of Research Evidence Reviewed (2006-2016)

Note: ppm represents parts per million

<table>
<thead>
<tr>
<th>Author (year)</th>
<th>Outcome</th>
<th>Study Description</th>
<th>Fluoride Exposure parts per million (ppm)</th>
<th>Key Findings</th>
<th>Quality Rating of Study Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Archer et al. (2016)</td>
<td>Osteosarcoma</td>
<td>• Type: Case Control</td>
<td></td>
<td>• No relationship was found between fluoride in public drinking water and childhood/adolescent osteosarcoma</td>
<td>Strong</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Population: Children and adolescents</td>
<td></td>
<td>• There was no difference in the odds of childhood osteosarcoma due to fluoride source (natural vs. fluorosilicic acid)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Country: United States</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sample: 1,510</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Concentration range = 0.1 to 5.5 ppm</td>
<td></td>
</tr>
<tr>
<td>Armfield et al. (2013)</td>
<td>Tooth decay/infections/dentition</td>
<td>• Type: Cross-sectional/ ecological</td>
<td></td>
<td>• In children, tooth decay was significantly associated with consuming sugar-sweetened beverages</td>
<td>Strong</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Population: Children</td>
<td></td>
<td>• For children with more than 50% lifetime exposure to fluoridated water there was no association between sweetened drink consumption and decayed, missing, or filled permanent teeth</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Country: Australia</td>
<td></td>
<td>• For children with lower lifetime exposure (&lt; 50%), the number of decayed, missing or filled permanent teeth was 46% higher in children consuming 3 or more sweetened drinks/day than for children who were not consuming sweetened drinks</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sample: 16,508</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Fluoridated: 0.5 to 1 ppm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Non-fluoridated: Not reported</td>
<td></td>
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</tbody>
</table>
# APPENDIX I
## UPDATED REVIEW OF EVIDENCE ON THE EFFECTIVENESS AND SAFETY OF COMMUNITY WATER FLUORIDATION

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<tr>
<th>Author (year)</th>
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<th>Study Description</th>
<th>Fluoride Exposure parts per million (ppm)</th>
<th>Key Findings</th>
<th>Quality Rating of Study Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bassin et al. (2006)</td>
<td>Osteosarcoma</td>
<td>Type: Case-control • Population: Children/adolescents 0 to 20 years • Sample: 103</td>
<td>High versus low ppm</td>
<td>High versus low fluoride level exposure in drinking water was associated with higher incidence of osteosarcoma among males 0 to 14 years but not females • The association peaked at 6-8 years of age; Seven year old males with high fluoride exposure were 5.5 times more likely to have osteosarcoma (odds ratio= 5.46; 95% CI: 1.50 to 19.9)</td>
<td>Poor</td>
</tr>
<tr>
<td>Blakely et al. (2014)</td>
<td>Osteosarcoma and Ewing Sarcoma</td>
<td>Type: Cross-sectional/ ecological • Population: Children and adults • Country: United Kingdom • Sample: 4,216</td>
<td>Fluoridated: &lt;1.5 ppm • Non-fluoridated: Not reported</td>
<td>In children and adults there was no association between fluoridated drinking water and osteosarcoma risk, Ewing sarcoma risk</td>
<td>Strong</td>
</tr>
<tr>
<td>Blinkhorn et al. (2015)</td>
<td>Tooth decay</td>
<td>Type: Ecological • Population: Children 5-7 years; • Country: Australia • Sample: 2,129</td>
<td>Not reported</td>
<td>Children 5-7 years of age living in the fluoridated area had significantly lower DMFT scores (1.40) in comparison to those in the pre-fluoridated (2.02) and non-fluoridated (2.09) areas • The proportion of caries free children were higher in the fluoridated area (62.6%) compared to pre-fluoridated (50.8%) and non-fluoridated area (48.6%)</td>
<td>Moderate</td>
</tr>
</tbody>
</table>
### Updated Review of Evidence on the Effectiveness and Safety of Community Water Fluoridation

<table>
<thead>
<tr>
<th>Author (year)</th>
<th>Outcome</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Broadbent et al. (2014)</td>
<td>Intelligence Quotient (IQ)</td>
<td>• Type: Cohort&lt;br&gt;• Population: Children and adults&lt;br&gt;• Country: New Zealand&lt;br&gt;• Sample: 1,037</td>
<td>• Fluoridated: 0.85 ppm&lt;br&gt;• Non-fluoridated: 0 to 0.03 ppm</td>
<td>• Children followed from birth living in fluoridated communities did not differ in IQ than those in non-fluoridated communities. This held true at 38 years of age&lt;br&gt;• There was no significant difference in IQ between those who had or had not used fluoride toothpaste or used fluoride tablets</td>
<td>Strong</td>
</tr>
<tr>
<td>Cho et al. (2014)</td>
<td>Tooth decay</td>
<td>• Type: Cross-sectional/ecological&lt;br&gt;• Population: Children 6, 8 and 11 years&lt;br&gt;• Country: South Korea&lt;br&gt;• Sample: 1,485</td>
<td>• Not reported</td>
<td>• Children 11 years of age living in a water fluoridated-ceased area who ingested fluoridated water for ~ 4 years after birth had 12% lower caries rates than those living in a non-fluoridated area&lt;br&gt;• There were no significant differences in caries rates in 6 and 8 year olds</td>
<td>Poor</td>
</tr>
<tr>
<td>Cho et al. (2014)</td>
<td>Tooth decay</td>
<td>• Type: Cross-sectional/ecological&lt;br&gt;• Population: Children 11 years&lt;br&gt;• Country: Korea&lt;br&gt;• Sample: 1,446</td>
<td>• Not reported</td>
<td>• Children living in fluoridated areas had a lower rates of caries across different socio-economic groups compared to children living in non-fluoridated areas</td>
<td>Poor</td>
</tr>
<tr>
<td>Choi et al. (2012)</td>
<td>Intelligence</td>
<td>• Type: Systematic review&lt;br&gt;• Population: Children 4 to 16 years&lt;br&gt;• Country: China and Iran&lt;br&gt;• # of studies: 27 single studies</td>
<td>• Range: 0.4 to 11.5 ppm</td>
<td>• Pooled analysis of 27 studies: Children living in high-fluoride areas in rural China and Iran (up to 11.5 ppm) had significantly lower IQ scores than those who lived in low-fluoride areas&lt;br&gt;• Authors acknowledged that “each of the [studies] reviewed had deficiencies, in some cases rather serious, which limit the conclusions that can be drawn.”(pg.1367); and the difference in IQ scores between the high- and low-fluoride groups “may be within the measurement error of IQ testing.”(pg. 1366)</td>
<td>Moderate</td>
</tr>
<tr>
<td>Author (year)</td>
<td>Outcome</td>
<td>Study Description</td>
<td>Fluoride Exposure parts per million (ppm)</td>
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<td>Quality Rating of Study Methodology</td>
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</tr>
<tr>
<td>Crocombe et al. (2015)</td>
<td>Tooth decay /infections/ dentition</td>
<td>• Type: Cross-sectional/ ecological&lt;br&gt;• Population: Adults 15-46 years&lt;br&gt;• Country: Australia&lt;br&gt;• Sample: 466</td>
<td>Fluoridated: 0.3-0.7 ppm; ≥0.7 ppm&lt;br&gt;Non-fluoridated: &lt;0.3 ppm</td>
<td>Rural adults 15-46 years of age with 50% or higher lifetime exposure to fluoridated water had significantly lower decayed, missing or filled permanent teeth (mean=6.01) and lower numbers of filled teeth (4.08) than adults with 50% or less lifetime exposure (mean= 9.14; number of filled teeth=7.06)</td>
<td>Strong</td>
</tr>
<tr>
<td>Do et al. (2014)</td>
<td>Tooth decay</td>
<td>• Type: Cross-sectional/ ecological&lt;br&gt;• Population: Children 8-12 years&lt;br&gt;• Country: Australia&lt;br&gt;• Sample: 2,611</td>
<td>Not reported</td>
<td>Children 8-12 years of age having a higher percentage of 3-year lifetime exposure to fluoridated water had significantly lower rates and severity of caries&lt;br&gt;Children having a higher percentage of 3-year lifetime exposure to fluoridated water had higher rates of mild fluorosis</td>
<td>Moderate</td>
</tr>
<tr>
<td>Do &amp; Spencer (2015)</td>
<td>Tooth decay</td>
<td>• Type: Cross-sectional/ ecological&lt;br&gt;• Population: Children 5-14 years&lt;br&gt;• Country: Australia&lt;br&gt;• Sample: 5,400</td>
<td>Not reported</td>
<td>Children 5-8 years of age living in fluoridated areas had 39% lower risk of caries compared to children living in non-fluoridated areas&lt;br&gt;Children 9-14 years of age living in fluoridated areas had 37% lower risk of caries compared to children living in non-fluoridated areas</td>
<td>Moderate</td>
</tr>
</tbody>
</table>
## APPENDIX I
UPDATED REVIEW OF EVIDENCE ON THE EFFECTIVENESS AND SAFETY OF COMMUNITY WATER FLUORIDATION

<table>
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<tr>
<th>Author (year)</th>
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</tr>
</thead>
</table>
| Elmer et al. (2014) | Tooth extraction related to tooth decay | • Type: Hospital chart review  
• Population: Patients 0-19 years;  
• Country: England  
• Sample: NOT REPORTED | • Not reported | • In 0-19 year-olds, rates of hospital admissions for the extraction of decayed teeth was significantly lower in areas with a fluoridated water supply than non-fluoridated. Note: the results were adjusted for levels of deprivation using the Index of Multiple Deprivation. Among the most deprived areas, rates of admission in the West Midland’s (fluoridated) varied between 4.17 and 4.91 per 10,000 while similar deprived areas in the North West (non-fluoridated) had rates between 51.51 and 112.58 per 10,000 | No validated tool available to appraise this type of study |
| Grandjean & Landrigan (2014) | Intelligence/neurotoxicity | • Type: Non-systematic literature review  
• Population: Children and adults  
• # of studies: 1 systematic review | • Not reported | • Based on the findings from Choi et al. (2012) systematic review, the authors recommend to classify fluoride as a neurotoxin  

**Note:** see notes on Choi et al. (2012) above | Poor |
| Hashizume et al. (2013) | Tooth decay | • Type: Cross-sectional/ecological  
• Population: Children 8-10 years  
• Country: Brazil  
• Sample: 441 | • Not reported | • The widespread use of fluoride in the public water supply and dentifrices decreased the prevalence of hidden caries (using x-rays) by 13.5% in Brazilian children; hidden caries was 26.4% in 1975 and 12.9% in 1996 | Poor |
| Iheozor-Ejiofor et al. (2015) | Tooth decay | • Type: Systematic review of prospective controlled studies  
• Population: Children  
• # of studies: 19 single studies | • Fluoridated: 0.5 to 1.2 ppm  
• Non-fluoridated: <0.4 ppm | Pooling of single studies comparing children living in fluoridated to low/non-fluoridated areas showed:  
• 35% reduction in baby tooth decay (n=9; 44,268 children)  
• 26% reduction in permanent tooth decay (n=10; 78,764 children) | Strong |
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### UPDATED REVIEW OF EVIDENCE ON THE EFFECTIVENESS AND SAFETY OF COMMUNITY WATER FLUORIDATION

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<tr>
<th>Author (year)</th>
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<th>Quality Rating of Study Methodology</th>
</tr>
</thead>
</table>
|               | Dental fluorosis | • Type: Systematic review of prospective controlled studies  
Population: Children  
# of studies: 40 single studies | • Fluoride in the water: 0.1, 0.4, 0.7 ppm | • 15% increase in children with no tooth decay (n=18; 93,504 children) | Poor |
| Johnson et al. (2014) | Tooth decay | • Type: Before-after  
Population: Children 4-15 years  
Country: Australia  
Sample: 324 | • Not reported | • At a fluoridation level of 0.7 ppm, it was estimated that about 12% of people would have fluorosis of aesthetic concern  
• At 0.4 and 0.1 ppm 10% and 8% would have fluorosis of aesthetic concern | |
| Klivitsky et al. (2015) | Tooth decay | • Type: Cross-sectional/ecological  
Population: Children <18 years  
Country: Israel  
Sample: 1,413 | • Fluoridated: >0.7 ppm  
Non-optimally fluoridated: <0.5 ppm | • In children 4-15 years of age, seven years of initiating water fluoridation reduced the caries rate and severity by 37%  
• This reduction was most noticeable in younger children (4-9 years); with caries rates decreasing by 50% | Moderate |
| Koh et al. (2015) | Tooth decay | • Type: Before-after  
Population: Children 4-9 years  
Country: Australia  
Sample: 457 | • Fluoridated: 0.6 to 0.8 ppm  
Non-fluoridated: NR | • Children younger than 18 years of age living in non-optimally fluoridated cities were two times more likely to report hospitalizations for dental infections than children living in optimally fluoridated cities  
• This effect was more noticeable in populations of lower socio-economic status | Poor |
| Levy et al. (2012) | Osteosarcoma | • Type: Cross-sectional/ ecological  
Population: Children | • Concentration range 0.7 to 4.0 ppm | • In children living in the continental U.S., CWF was not associated with osteosarcoma rates  
• Note: Water fluoridation status was categorized | Strong |
## APPENDIX I
UPDATED REVIEW OF EVIDENCE ON THE EFFECTIVENESS AND SAFETY OF COMMUNITY WATER FLUORIDATION

<table>
<thead>
<tr>
<th>Author (year)</th>
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<th>Fluoride Exposure parts per million (ppm)</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
<tr>
<td>Levy et al. (2014)</td>
<td>Bone density</td>
<td>• Type: Cohort</td>
<td>as low (&lt; 30%) or high (≥ 85%) according to the percentage of the population receiving fluoridated water</td>
<td>In children 15 years of age there was no association between fluoride intake and bone density</td>
<td>Moderate</td>
</tr>
<tr>
<td>Malin &amp; Till (2015)</td>
<td>Attention Deficit Hyperactivity Disorder (ADHD)</td>
<td>• Type: Cross-sectional/ecological</td>
<td></td>
<td>Parents of 4-17 year olds living in U.S. states with a greater proportion of people receiving fluoridated water reported higher rates of ADHD in their children</td>
<td>Poor</td>
</tr>
<tr>
<td>McDonagh et al. (2000)</td>
<td>Tooth decay</td>
<td>• Type: Systematic review</td>
<td></td>
<td>Pooling of single studies comparing children living in fluoridated to low/non-fluoridated areas showed:</td>
<td>Strong</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Population: Children and adults</td>
<td></td>
<td>o Less decayed, missing or filled primary/permanent teeth by 2.25 teeth</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Country: International (30 Countries)</td>
<td></td>
<td>o 15% increase in caries free children</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• # of studies: 26 single studies</td>
<td></td>
<td>In studies completed after 1974, a beneficial effect of water fluoridation was still evident in spite of the assumed exposure to non-water fluoride (e.g., toothpaste)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Fluoridated: 0.7 to 1.2 ppm</td>
<td></td>
<td>There is some evidence that water fluoridation reduces the inequalities in decayed, missing or filled primary/permanent teeth across social classes in 5 and 12 year-olds. This effect was not seen in the proportion of caries-free children among 5 year-olds. The data for the</td>
<td></td>
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</thead>
</table>
|               | Dental fluorosis | • Type: Systematic review  
• Population: Children  
• # of studies: 88 single studies | • Fluoridated: 0.6 to 1.2 ppm  
• Low natural fluoride in the water: <0.3 ppm  
• High natural fluoride in the water: 4-7 ppm | • The prevalence of fluorosis at a water fluoride level of 1.0 ppm was estimated to be 48% and for fluorosis of aesthetic concern it was predicted to be 12.5% | |
|               | Bone fracture or development | • Type: Systematic review  
• Population: Children and adults  
• # of studies: 29 single studies | • Range: <0.3 to 8.0 ppm | • There is no association between bone fracture or bone health and water fluoridation | |
|               | Cancer | • Type: Systematic review  
• Population: Children and adults  
• # of studies: 26 single studies | • Range: <0.3 to 8.0 ppm | • There is no association between all cancer incidence or mortality (including osteosarcoma, bone/joint and thyroid cancers) and water fluoridation | |
|               | Other safety outcomes: Down syndrome, mortality, senile dementia, goitre | • Type: Systematic review  
• Population: Children and adults  
• # of studies: 33 single studies | • Range: <0.3 to 8.0 ppm | • Insufficient evidence to reach a conclusion | |
<table>
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<tr>
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<tbody>
<tr>
<td>McGrady et al. (2012)</td>
<td>Dental caries /infections /Dentition</td>
<td>Type: Cross-sectional/ecological • Population: Children • Country: United Kingdom • Sample: 1,783</td>
<td>Fluoridated: 1.0 ppm • Non-fluoridated: Not reported</td>
<td>Children living in the fluoridated community had significantly less decayed, missing or filled teeth (mean=2.94) than those living in the non-fluoridated community (mean=4.48) • This benefit was observed across socio-economic groups • The odds for developing mild fluorosis was 3 times higher in the fluoridated community than the non-fluoridated community (odds ratio=3.3)</td>
<td>Strong</td>
</tr>
<tr>
<td>McLaren et al. (2013)</td>
<td>Tooth decay /infections /dentition</td>
<td>Type: Cross-sectional/ecological • Population: Children • Country: Canada • Sample: 1,017</td>
<td>Not reported</td>
<td>Children living in fluoridated communities had significantly reduced odds (coefficient= -0.44) of having 3 more decayed, missing or filled baby or permanent teeth versus 0 decay than those living in non/low fluoridated communities • This benefit was observed across socio-economic groups and children with the lowest socio-economic status benefited most</td>
<td>Strong</td>
</tr>
<tr>
<td>McLaren et al. (2016)</td>
<td>Dental caries</td>
<td>Type: Cross-sectional/ecological • Population: Children • Country: Canada • Sample: 12,581</td>
<td>Not reported</td>
<td>There was an increase in dental caries on smooth surfaces in grade two children living in both Calgary and Edmonton between 2004/05 and 2013/14 • This increase in caries was larger and more consistent in Calgary where CWF cessation occurred • Change over time in mean primary tooth decay surfaces in Calgary = 2.87; and in Edmonton = 1.60. Difference in change over time between cities was statistically significant</td>
<td>Moderate</td>
</tr>
<tr>
<td>McLaren et</td>
<td>Dental caries</td>
<td>Type: Uncontrolled</td>
<td>Not reported</td>
<td>Among grade 2 children living in Calgary,</td>
<td>Moderate</td>
</tr>
</tbody>
</table>
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<tr>
<td>al. (2016)</td>
<td>and inequities</td>
<td>before-after</td>
<td>absence of dental insurance was associated with higher mean permanent decayed, missing or filled teeth in 2013/14 after fluoridation was discontinued (Relative Risk = 1.56), but not in 2009/10 (Relative Risk = 0.87) • There were no statistically significant differences in mean primary tooth decay • Absence of dental insurance was associated with greater likelihood of having two or more instances of untreated decay (primary or permanent), in both 2009/10 (Odds ratio = 1.76), and 2013/14 (Odds ratio = 2.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>McLaren &amp; Singhal (2016)</td>
<td>Tooth decay</td>
<td>Type: Systematic review</td>
<td>Results from published studies are mixed, but pointed more to an increase in dental caries in children post-CWF cessation • Of the 9 studies with at least moderate methodological quality, 5 reported an increase in caries post-cessation, 3 studies did not report an increase and one reported mixed results</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mullen et al. (2012)</td>
<td>Tooth decay/infections/dentition</td>
<td>Type: Cross-sectional/ecological</td>
<td>Children living in fluoridated communities had significantly less decayed, missing or filled permanent teeth (mean=2.54) and restorations (mean=2.01) than those living in non-fluoridated communities (mean=3.63; restorations mean=3.11) • Children were also categorized into four lifetime exposure categories: No exposure</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Mullen et al. (2012)
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<tbody>
<tr>
<td>Nasman et al. (2013)</td>
<td>Hip fracture</td>
<td>• Type: Cohort&lt;br&gt;• Population: Older adults&lt;br&gt;• Country: Sweden&lt;br&gt;• Sample: 473,277</td>
<td>Range: 0.1 to 2.7ppm</td>
<td>• Children with the highest lifetime exposure to fluoridated water (81-100%) had significantly less decayed, missing or filled permanent teeth (mean=2.42) than those with no/zero exposure (mean=3.61) &lt;br&gt;• There were also significantly fewer restorations in both the high exposure group (mean 1.98) and medium exposure (mean=2.33) compared to the no exposure group (mean=3.10)</td>
<td>Strong</td>
</tr>
<tr>
<td>National Research Council (2006)</td>
<td>Outcomes related to the endocrine system</td>
<td>• Type: Non-systematic literature review&lt;br&gt;• Population: Children and adults&lt;br&gt;• # of studies: NR</td>
<td>Not reported</td>
<td>Thyroid&lt;br&gt;• Some human and animal studies suggest abnormal thyroid function and/or goitre may be associated with higher levels of fluoride, particularly when iodine levels are low. Most of the human studies were conducted in developing countries. The human studies conducted in developed countries did not report an effect on goitre (two studies) or thyroid function (one study)&lt;br&gt;Parathyroid&lt;br&gt;• Some animal and human studies reported high levels of fluoride may have an impact on calcium and/or parathyroid function</td>
<td>Poor</td>
</tr>
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</table>

Thyroid parafollicular
### APPENDIX I
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</tr>
</thead>
</table>
| O’Sullivan et al. (2015) | Tooth decay | Type: Cross-sectional/ecological  
Population: Adults >50 years  
Country: Ireland  
Sample: 4,977 | Fluoridated: 0.6 to 0.8 ppm  
Non-fluoridated: Not reported | Some studies involving people with skeletal fluorosis or workers exposed to high levels of fluoride reported associations with increased calcitonin levels (i.e., inhibition of bone resorption)  
Pineal gland  
One animal study reported high doses of fluoride have some effects on melatonin production and sexual maturation. The human studies showed no effect | Moderate |
| Peckham et al. (2015) | Hypothyroidism | Type: Cross-sectional/ecological  
Population: Age not reported  
Country: England  
Sample: 7,935; | Not reported | Glucose intolerance  
A small number of animal studies in diabetic and normal animals suggest that high doses of fluoride may trigger glucose intolerance. A few human studies involving populations with high exposures to fluoride reported impaired tolerance of glucose. Other studies reported no effect  
The odds of a general practitioner practice recording high levels of hypothyroidism was 37% higher in areas with maximum fluoride of >0.3 and ≤0.7 ppm and 62% higher in areas with >0.7 ppm, than practices in areas with maximum fluoride ≤0.3 ppm | Poor |
# Appendix I
## Updated Review of Evidence on the Effectiveness and Safety of Community Water Fluoridation

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</tr>
</thead>
</table>
| Perez-Perez et al. (2014) | Dental fluorosis | • Type: Cross-sectional/ ecological  
• Population: Children 8-14 years  
• Country: Mexico  
• Sample: 917 | • Fluoridated tap water: 0.7 ppm  
• Well water: 0.43 ppm  
• Bottled water: < 1.5 ppm | • In children 8-14 years of age there was no association between fluoridated water and the level of fluorosis | Moderate |
| Peterson et al. (2015) | Arsenic from fluoridation | • Type: Cross-sectional/ecological  
• Population: drinking water samples from Ontario  
• Country: Canada  
• Sample: 2,658 | • Fluoridated: mean = 0.53 mg/L  
• Non-fluoridated: 0.12 mg/L | • Drinking water treatment was found to reduce arsenic levels in water in both fluoridated and non-fluoridated systems by 0.2 ug/L (0.0002 mg/L)  
• Fluoridated drinking water systems were associated with an additional 0.078 ug/L (0.000078 mg/L) of arsenic in water when compared to non-fluoridated water systems | Strong |
| Ran & Chattopadhyahet (2016) | Economic evaluation of fluoridation | • Type: Systematic review of economic studies  
• Population: Children and adults  
• Country: International  
• # of studies: 10 single studies | • Not reported | • This updated review included 10 studies, four reporting CWF benefits only, and six reporting both costs and benefits (Note: the previous review was conducted in 2002 and included nine studies)  
• All included studies reported CWF to be a value-for-money intervention, and its benefits increased with community population size  
  o The four benefit-only studies reported lower dental costs in fluoridated vs. non-fluoridated communities  
  o In the six cost-benefit studies, per capita annual fluoridation costs ranged from $0.11 to $4.92, and benefits | Moderate |
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</table>
| Rugg-Gunn & Do (2012) | Tooth decay   | • Type: Non-systematic literature review  
• Population: Children ≥ 12 years  
• # of studies: 59 single studies | Not reported                        | Studies conducted after 1990 report lower effect in caries reduction than studies before 1990  
Reductions in recent studies are still substantial                                                                                                                                  | Poor                               |
| Schwartz (2014)     | Eye cancer    | • Type: Cross-sectional/ecological  
• Population: Children and adults of all ages  
• Country: United States  
• Sample: Census data from 44/55 states | Not reported                        | US states with greater access to fluoridated water had lower rates of eye cancer incidence                                                                                              | Moderate                           |
| Slade et al. (2013) | Tooth decay/infections/dentition | • Type: Cross-sectional/ecological  
• Population: Adults  
• Country: Australia  
• Sample: 3,779 | Fluoridated: 0.5 to 1 ppm  
Non-fluoridated: NR | Australian adults with prolonged lifetime exposure to CWF versus negligible exposure had 12% lower decayed, missing or filled permanent teeth in the pre-1960 cohort and 11% lower in the 1960-1990 cohort | Strong                             |
| Yeung (2008)        | Tooth decay   | • Type: Systematic review; non-randomized trial; before-after; time series; cohort; cross- | Fluoridated: 0.7 to 1.0 ppm  
Non-fluoridated: | Pooling of single studies comparing children living in fluoridated to non-fluoridated areas showed:  
• 14% reduction in tooth decay (n=9; number of children not reported)                                                                                                           | Strong                             |
## Updated Review of Evidence on the Effectiveness and Safety of Community Water Fluoridation

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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dental fluorosis</td>
<td>sectional/ecological</td>
<td>• Population: Children&lt;br&gt;  • # of studies: 31 studies</td>
<td>• Fluoridated: 0.7 ppm&lt;br&gt;  • Non-fluoridated: 0.4 ppm</td>
<td>• Three times more likely to have improvements in baby/permanent teeth (n=9; number of children not reported)&lt;br&gt;  • In fluoridated areas, there was 4-5% increase in fluorosis than non-fluoridated areas&lt;br&gt;  • Increase in water fluoride level from 0.4 ppm to 0.7 ppm would lead to one additional person with fluorosis of aesthetic concern for every 55 people consuming fluoridated water</td>
</tr>
<tr>
<td></td>
<td>Bone fracture or Osteoporosis</td>
<td>sectional/ecological</td>
<td>• Population: Children&lt;br&gt;  • # of studies: 77 studies</td>
<td>• Range: 0.25 to 8.0 ppm</td>
<td>• No association between water fluoridation (1.0 ppm) and bone fracture or osteoporosis</td>
</tr>
<tr>
<td></td>
<td>Cancer (All-cause, Bone/Joint, Osteosarcoma and Thyroid)</td>
<td>sectional/ecological</td>
<td>• Population: Children and adults&lt;br&gt;  • # of studies: 30 single studies</td>
<td>• Fluoridated: 1.0 ppm&lt;br&gt;  • Non-fluoridated: various levels or lowest ppm</td>
<td>• No association between water fluoridation (1.0 ppm) and cancer of all-cause, bone/joint cancer, osteosarcoma, thyroid cancer or mortality</td>
</tr>
<tr>
<td></td>
<td>Other Health Outcomes: Dementia, Still Births</td>
<td>sectional/ecological</td>
<td>• Population: Children and adults&lt;br&gt;  • # of studies: 30 single studies</td>
<td>• Fluoridated: 1.0 ppm&lt;br&gt;  • Non-fluoridated:</td>
<td>• Insufficient evidence to suggest an association between fluoridation and 12 adverse health outcomes</td>
</tr>
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</table>
| Young et al. (2015) | Hip fracture, Down syndrome, all-cancer, all-cause mortality and osteosarcoma | Ecological  
- Population: Children and adults  
- # of studies: 30 single studies | Different levels or lowest ppm | In children and adults, there was no association between CWF and hip fractures, Down syndrome, all-cancer, all-cause mortality or osteosarcoma  
People living in fluoridated areas had a 8% lower incidence rate for renal stones and bladder cancer, respectively, than those living in non-fluoridated areas | Strong |
| Zohoori et al. (2014) | Fluoride intake | Ecological  
- Population: Infants 1-12 months  
- Country: United | Mean total daily fluoride intake of infants living in fluoridated and non-fluoridated areas was 0.107 and 0.024 mg/kg body weight per day, respectively  
Total daily fluoride intake of 79% of infants | Poor |
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<td>Kingdom</td>
<td></td>
<td>Sample: 38 communities (n=19 fluoridated community; n= 19 non-fluoridated community)</td>
<td>Non-fluoridated: 0.024 mg/kg body weight</td>
<td>living in the fluoridated area exceeded the fluoride intake threshold of 0.07 mg/kg body weight per day. Total daily fluoride intake of 95% of infants living in the non-fluoridated areas were below the lower threshold of the suggested ‘optimal’ fluoride intake (0.05 mg/kg body weight per day)</td>
<td></td>
</tr>
</tbody>
</table>
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References


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UPDATED REVIEW OF EVIDENCE ON THE EFFECTIVENESS AND SAFETY OF COMMUNITY WATER FLUORIDATION


Review of Evidence and Community Water Fluoridation Across Ontario

Community Water Fluoridation Committee
October 13, 2016

Eileen de Villa, MD, MBA, MHSc, CCFP, FRCPC
Medical Officer of Health
Review of Research Evidence

(Part 1)
Purpose of Evidence Review

There is extensive published evidence on the subject of CWF. The purpose of this evidence review is to provide:

- an up-to-date **summary** of the published research
- a **synthesis** of the large amounts of data presented in research
- an **analysis** of the results of the research
Approach to Evidence-Informed Decision Making

**Comprehensive Search**
- Search of electronic databases by a trained librarian;
- Automated database alerts to immediately identify newly published studies;
- Review any study requested by members of Council or their constituents

**Relevance Criteria**
- Studies were included if they were:
  - published in English;
  - were systematic reviews, experimental or observational studies; and
  - assessed the effect of CWF within the range of 0.5 -1.2 mg/L on any health outcome
- Studies were excluded if they were:
  - outside of the range, in vitro or performed on animals;
  - non-systematic (literature) reviews, opinion notes, editorials;
  - if the study methodology was not reported

**Critical Appraisal**
- Validated critical appraisal tools were selected according to the type of study design, such as:
  - Health-Evidence Quality Assessment of Reviews Tool
  - Cochrane Effective Practice and Organisation of Care Risk-of-Bias Tool
  - Critical Appraisal Skills Programme Cohort Study Checklist
  - 11 Questions to Help You Make Sense of Descriptive /Cross-sectional Studies Tool
- Two experienced reviewers independently appraised the methodological quality of all included studies
Evidence Review Focus

Topic Area:
Evidence on the Effectiveness and Safety of Community Water Fluoridation

Process

Is the process undertaken by study researchers:
- Reliable?
- Replicable?

Results

Are the results reported by study researchers relevant?
How do the results relate to existing evidence?
Results of Evidence Review

Safety

- One systematic review of 30 studies and six strong single studies reported on safety. Across these studies, 19 safety outcomes were assessed: cancer of all causes, thyroid cancer, bone 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.

- Studies assessing the safety of CWF do not support a link between fluoride in drinking water at the optimal concentration (0.7mg/L) and any adverse health effects.
Results of Evidence Review

Effectiveness

- Two systematic reviews (total of 50 single studies) reported beneficial effects when comparing children living in fluoridated and low/non-fluoridated communities. When comparing children living in fluoridated (0.5-1.2 parts per million [ppm]) to low/non-fluoridated (<0.4 ppm) areas findings included:
  - 35 per cent reduction in cavities in baby teeth (pooling of nine studies = 44,268 children)
  - 26 per cent reduction in cavities in permanent teeth (pooling of 10 studies = 78,764 children)
  - 15 per cent increase in children with no cavities (pooling of 18 studies = 93,504 children)

- Two recent, strong quality single studies assessed equity and both found the benefits of CWF to be equally distributed across socioeconomic groups, with some benefits being more pronounced in children of low income families.
Results of Evidence Review

Dental Fluorosis

• One systematic review of 40 studies (59,630 children) reported that in a community where water is fluoridated to 0.7 ppm, an estimated 12 per cent of children would be expected to have fluorosis of aesthetic concern; at a water fluoride level of 0.1 ppm, eight per cent of children would have fluorosis of aesthetic concern.

• A recent, strong quality single study reported 45 per cent of children in the fluoridated community had fluorosis (of any level) versus 27 per cent of children living in the non-fluoridated area.

• In Canada, 16% of children aged 6-12 years have fluorosis at very mild-mild levels. Moderate–severe levels are so low, they are not reportable.
Toxicological Analysis

• For fluoridation additives and residuals

• For fluoride
  – Health Canada position, based on approximately 430 studies:
    • Health Canada has established the guideline for fluoride in drinking water as a maximum acceptable concentration of 1.5 milligrams per litre. Water containing fluoride at, or below, this maximum acceptable concentration does not pose a risk to human health.
Community Water Fluoridation across Ontario

(Part 2)
Purpose of Jurisdictional Review

The purpose of this jurisdictional evidence review is to:

• Provide a **summary of best-available information** on community water fluoridation across jurisdictions

• **Better understand the rationale** for decisions on community water fluoridation
Approach to Jurisdictional Review

• In the absence of national-level coordination to monitor and report on CWF, staff relied on:

  – Consultations with the Ministry of the Environment and Climate Change (MOECC)

  – Online scan of council documents and relevant media

  – Direct contact with key informants within jurisdictions of interest, when possible
Types of Decisions related to CWF

- Decisions are typically multi-faceted and made at the local level. In general, there are three types of decisions made related to community water fluoridation:
  - Start or Not
  - Continue or Discontinue
  - Change Fluoridation Additive

- Decisions may be influenced by various factors, such as:
  - Health considerations
  - Technical (e.g., equipment)
  - Financial
  - Resident/community input
  - Water system operator decisions
Results of Jurisdictional Review

- In Ontario, as of January 11, 2016, there were approximately 75 municipal residential drinking water systems in Ontario with fluoridation.

- In 2012, approximately 67.3 per cent of the population lived in a community with a fluoridated water system.
### Examples of Decisions Across Ontario

<table>
<thead>
<tr>
<th>Start</th>
<th>Not Start</th>
<th>Continue</th>
<th>Discontinue</th>
<th>Change Additive</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Port Severn (Lone Pine) Drinking Water System(^1) (DWS)</td>
<td>• Town of Kingsville</td>
<td>• City of Toronto</td>
<td>• Huntsville (Fairyview) DWS(^1)</td>
<td>• City of Toronto</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• City of Hamilton</td>
<td>• Birch Glen (Baysville) DWS(^1)</td>
<td>• Region of Durham</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Region of Halton</td>
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<td>• Region of Norfolk</td>
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<td>• Town of Amherstburg</td>
<td>• Smiths Falls</td>
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<tr>
<td></td>
<td></td>
<td>• Town of Bracebridge(^1)</td>
<td>• Town of Kirkland Lake</td>
<td></td>
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<tr>
<td></td>
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<td></td>
<td>• Town of Lakeshore</td>
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<td>• Region of Waterloo</td>
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<td>• Town of Parry Sound</td>
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<td>• Township of Nairn and Hyman</td>
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<td></td>
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<td></td>
<td>• City of Cornwall (decision pending)</td>
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</table>

\(^1\)Local municipalities within the District Municipality of Muskoka
Summary

- Research evidence continues to confirm that CWF is effective and safe, when practiced within the optimal range.

- Jurisdictions across Ontario continue to discuss and make local decisions about CWF.
Dear Water Fluoridation Committee Members:

I have followed the Peel fluoridation lawsuit since it was initiated and the fluoridation issue in general since the 1980s. Although I have studied the science in detail, I am not writing to comment on the benefits or risks involved. The primary issue, in my mind, is that adding HFSA to water appears to be illegal under Section 20 of the OSDWA.

As pointed out by your Regional Solicitor in his recent presentation, HFSA carries with it measurable levels of arsenic and lead. These two elements have the distinction of being the only ones found in water for which the US EPA has set a Maximum Contaminant Level Goal of zero. Arsenic is a known cancer causing agent and the harms from lead are well accepted.

Section 20 states:

(1) No person shall cause or permit any thing to enter a drinking water system if it could result in,
(a) a drinking water health hazard;

The EPA clearly believes that any level of arsenic or lead in water could result in a drinking water health hazard. That is their only justification for setting the MCLGs at zero.

Mr. O'Connor noted in his presentation that the concentration of arsenic and lead in the treated water is below detection limit. This observation may be relevant from a scientific perspective but the OSDWA Section 20(3) notes that:

“For the purposes of prosecuting the offence of contravening subsection (1), it is not necessary to prove that the thing, if it was diluted when or after it entered the system, continued to result in or could have resulted in a drinking water health hazard. “

It seems clear from that statement that adding any level of arsenic or lead is a contravention of the OSDWA.

I would also like to point out that Mr O'Connor lists a concentration of arsenic in HFSA of 12.1 ppm. Please see the attachment for analyses of three different batches of HFSA received by the Region since 2012. These show substantially higher levels of arsenic (45.75 ppm to 68.75 ppm) than the level supplied by Mr. O'Connor.
There is another legal problem with the use of HFSA. The Fluoridation Act states in Section 1(c) "fluoridation system" means a system comprising equipment and materials for the addition of a chemical compound to release fluoride ions into a public water supply. 1960-61, c. 30, s. 1.

Note the use of the singular, “a chemical compound”. HFSA (H2SiF6) is a chemical compound. It is used to release fluoride ions as allowed in the Fluoridation Act. Arsenic or other contaminants are not part of this compound. There is no statutory requirement to add arsenic or lead, so any attempt to avoid liability by using the exception in 20(2) (b) of the OSDWA would not be supported.

There is a further legal problem in applying the NSF/ANSI Standard 60 to HFSA. This standard is applied to Drinking Water Treatment Chemicals, not Water Additives as implied by Mr. O'Connor. HFSA is not a water treatment chemical. It is added to treat people, and should be regulated by Health Canada as either a Drug or Natural Health Product. It is not. Health Canada is in violation of the Food and Drugs Act, as HFSA meets the definition of a Drug as described in the Act and Health Canada has acknowledged that they do not have any research showing efficacy or safety, as required under the regulations. Although this is a legal issue for Health Canada, it should be considered here for how it impacts the integrity of the regulatory framework described in Mr O'Connor's presentation. What else about Health Canada's endorsement of fluoridation is based on a deception?

Thank you for you consideration of this information.

David Green
President
Rocky Ridge Drinking Water Limited
Peterborough ON
CAR NO: SHPX204520  
Deliveries: 1001232016

Material: Our / Your reference 200011 FLUOROSILICIC ACID /

**Quality Certificate**

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</tr>
<tr>
<td>Net H2SiF6</td>
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<td>%</td>
</tr>
<tr>
<td>P2O5</td>
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Physical Analysis

| Density         | 1.2200 | g/cm3 |
| APHA            | 45.00  | CU    |

REFERRAL TO ______________________________
RECOMMENDED
DIRECTION REQUIRED _______________________
RECEIPT RECOMMENDED ✓

We certify that product shipped with this Certificate of Analysis, made AWWA B700-11

Kwasi Sakyi-Amfo  
QC Lab Supervisor - Riverview
This product was produced at the Production Plan: Riverview facility

CAR NO: GATX002036
Deliveries: 1001288234
Material: Our / Your reference 200011 FLUOROSILICIC ACID /

Quality Certificate
Date
01/29/2013
Purchase order item/date
4540329 / 01/09/2013
Delivery item/date
1001288234 000010 / 01/23/2013
Order item/date
1508377 000010 / 01/09/2013
Customer number
5002715

Inspection lot 100000056703 from 01/23/2013

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We certify that product shipped with this Certificate of Analysis meets AWWA 8703-11*
**Quality Certificate**

**Date:**
08/23/2012

**Purchase order item/date:**
45982012 / 07/28/2012

**Delivery item/date:**
10011118379 030010 / 08/13/2012

**Order item/date:**
1454367 000010 / 07/28/2012

**Customer number:**
5022715

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**CAR NO:** SHPX205964

**Deliveries:** 1001118379

**Material:** Our / Your reference
200011 FLUOROSILICIC ACID /

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**Inspection lot 100000052663 from 08/13/2012**

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"We certify that product shipped with this Certificate of Analysis meets AWSA/20/03.41"

**NSF**

Kwasi Sakyi-Amfo
QC Lab Supervisor - Riverview
July 4, 2016

To: Peel Region’s Community Water Fluoridation Committee

Water fluoridation benefits the citizens of Peel Region and I strongly encourage the committee to recommend to keep fluoride in the water.

I am a dentist and I work at a community health centre in Peel providing dental care to children in low-income families. I have seen first-hand the difference in decay rates, size and progression between fluoridated and non-fluoridated areas.

The level of fluoride in the water is only 0.7 ppm, which is the optimal amount to decrease decay without causing harm.

- Our water has half the amount of fluoride that is in seawater
- Our water has half the maximum amount of fluoride by Health Canada’s guideline
- Lake Ontario naturally has 0.15 ppm, but this level is too low to decrease dental decay
- Fluoride concentration: toothpaste: 1000 ppm, mouthwash: 230 ppm, dental office fluoride: 5000 ppm
- Our water only has 0.7 ppm and meets municipal, provincial, and federal guidelines for safety
- “Health Canada has established the guideline for fluoride in drinking water as a maximum acceptable concentration of 1.5 (ppm) milligrams per litre. Water containing fluoride at, or below, this maximum acceptable concentration does not pose a risk to human health.”

Water fluoridation is supported by medical and dental groups around the world.

- The World Health Organization states that fluoride is one of 14 essential mineral elements as being essential for good health.
- The Ontario Dental Association states “Community water fluoridation is a safe and effective means of preventing dental decay. Our position is based on the overwhelming scientific evidence available, and is driven by our dedication to the provision of exemplary oral health care to our patients and communities.”
- Health Canada states “Many studies have shown that fluoridated drinking water is a safe, effective and cost effective public health measure which significantly reduces the number of cavities in children’s teeth.”

The Guidelines for Canadian Drinking Water Quality states:

- “The weight of evidence from all currently available studies does not support a link between exposure to fluoride in drinking water at 1.5 mg/L and any adverse health effects, including those related to cancer, immunotoxicity, reproductive/developmental toxicity, genotoxicity and/or neurotoxicity. It also does not support a link between fluoride exposure and intelligence quotient deficit, as there are significant concerns regarding the relevant studies, including quality, credibility, and methodological weaknesses.”

Please trust the medical, health and water safety agencies and use evidence based research to make decisions that will benefit the entire community, especially those most vulnerable. Please keep the water in Peel Region fluoridated.

Yours Sincerely,

Dr. Sanjukta Mohanta

2 http://www.who.int/water_sanitation_health/dwq/nutrientsindw.pdf
3 http://youroralhealth.ca/personal-oral-care/fluoride-in-your-tap-water
Dear Kathryn,

I realize this is coming to you with short notice but I have managed to work in time for Dr. Susheela to make a presentation during the week of her visit to Canada.

Please add this to today's agenda. I am copying Councillor John Sprovieri on this email.

I know there have been many times things have been added to the City agenda at the last minute so I trust this will be one of them. Hopefully it can be read out for consideration at today's meeting.

Kathryn, I spoke to you awhile back and I was waiting to hear back from you as you were going to speak to Chair Parrish to let me know what the new protocol was for Delegations.

Also, I would like this added as a communication letter.

Thank you,
Liesa

Dear Water Fluoridation Committee and Regional Council Members:

We anxiously await the arrival of our honoured guest speaker from New Delhi India, World Renowned Fluoride Toxicity & Fluorosis Expert, Dr. A. K. Susheela Ph.D., F.S.Sc., F.A.M.S. who will be making a presentation on "The Harmful Effects of Fluoride on Human Health" at a special event on Wednesday, October 12th, 2016.

Professor (Dr) A.K. Susheela is from India with more than 35 years of research experience in the field of Fluoride and Fluorosis and its adverse effects on human health. Professor of Anatomy (Histocytochemist), member of the Faculty of the All India Institute of Medical Sciences, Director of the Fluorosis Research and Rural Development Foundation in New Delhi, Fellow of the Indian Academy of Sciences and the National Academy of Medical Sciences and a Sr. Consultant to the Indian Government. Dr. Susheela has published more than 100 scientific papers in international peer-reviewed biomedical journals. She has access to more than 70 years of fluoride research statistics and is one of the preeminent world experts on fluoride intoxication.
This invitation is two fold because we would like Dr. Susheela to present to the Water Fluoridation Committee but our major concerns lies in the fact that once the WFC has finalized their recommendation on whether to continue or cease the practice of fluoridation, it then must go back to Council, which at that point, citizens and experts may delegate the full Council as a whole in order to vote yay or nay on the recommendation made by the committee.

We feel it would be incumbent on all 25 members of Regional Council to listen to Dr. Susheela's presentation so that all Council members will be fully informed on the many harmful effects of fluoride on human health and well being of the residents of Peel given the fact that Dr. Susheela is the only person in the world doing extensive research on Fluoride and human health in her laboratory.

“The evidence I will provide on the harmful effects of fluoride on human health unequivocally proves the point that fluoride is disease causing and not disease preventing." Dr. A.K. Susheela

On a positive note, the Region will not incur any expense to the tax payers given the financial costs of bringing her to Canada have been sponsored by our generous supporters.

We ask for your prudent consideration be given to this special request due to the current status of the revised Delagation process which would allow for an invitation to hear Dr. Susheela's presentation as an expert with extensive research on Fluoride and Fluorosis on Thursday, October 13th, 2016.

We trust that you will appreciate this great opportunity to hear from Dr. Susheela, a preeminent world expert on fluoride intoxication.

We await your decision on this very important request.

Respectively Submitted,
Liesa Cianchino
Chair Concerned Residents of Peel to End Fluoridation