



**Ministère de la Santé  
et des Services sociaux**

Santé publique

# **Water fluoridation**

Questions & answers

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## Acknowledgement

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Produced by:

**Direction des communications, ministère de la Santé et des Services sociaux**

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Masculine pronouns are used generically in this document.

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## Table of Contents

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<b>What is Fluoride? .....</b>	<b>1</b>
1. What is fluoride? .....	1
2. What type of fluoride is used to fluoridate water? .....	1
3. What is the history of water fluoridation?.....	1
4. How does fluoride strengthen the teeth?.....	2
5. Why do we need water fluoridation? .....	3
6. What is the difference between topical fluoride and systemic fluoride?.....	3
7. Is there a difference between natural fluoride and the “artificial” fluoride used in fluoridating water supplies? .....	3
8. Is fluoride a nutrient?.....	4
9. Is fluoride a fertilizer? .....	4
<b>Water Fluoridation in Canada .....</b>	<b>5</b>
10. What percent of the Canadian population have access to fluoridated water? .....	5
11. Which large Canadian cities do not fluoridate their water supply? .....	5
12. Does the federal government regulate water fluoridation in Canada?.....	5
13. Why is the optimal level of fluoride different from the Maximum Acceptable Concentration (MAC) guideline for drinking water?.....	5
14. Do fluoride compounds in community water fluoridation meet national standards?.....	6
15. Does Health Canada support community water fluoridation? .....	6
<b>Fluoride Internationally .....</b>	<b>7</b>
16. Is community water fluoridation accepted internationally? .....	7
17. Are there countries that have “banned” fluoridation?.....	7
18. Who supports water fluoridation?.....	7
19. What do health organizations and agencies say about water fluoridation? .....	9
<b>Technical .....</b>	<b>11</b>
20. How is water fluoridated? What is the process? .....	11
21. Why do we need to fluoridate the water if there are other types of fluoride such as toothpaste, mouth rinses and professionally applied fluorides? .....	11

22. What are the units of measurement for fluoride in water? What does ppm and mg/L stand for? .....	11
23. What is the acceptable level of fluoride in drinking water supplies? .....	12
24. What is the optimal level of fluoride in drinking water? .....	12
25. Why has the recommended level of fluoride in drinking water changed from a range of 0.8 ppm to 1.2ppm to a level of 0.7 ppm?.....	12
26. Will the addition of fluoride affect the quality of the drinking water? .....	12
27. Will the addition of fluoride to my water affect its taste or odor? .....	13
28. Does water fluoridation corrode the waterlines in water distribution systems?.....	13
29. Is fluoride in drinking water classified as a drug under the <i>Food and Drugs Act</i> ?.....	13
30. Can fluoride be removed from the water? .....	13
31. Will boiling fluoridated water change the amount of fluoride in the water? .....	13
32. Is it wasteful to fluoridate the entire water system?.....	14
33. What is an individual's average daily fluoride intake?.....	14
34. Is my child getting an appropriate amount of fluoride from drinking water and tooth paste? .....	14
35. Once fluoride is ingested, where does it go?.....	14
36. Does bottled water contain optimal levels of fluoride? .....	14
37. I am feeding my baby formula. How do I know if my baby is getting too much fluoride? .....	15
<b>Efficacy .....</b>	<b>16</b>
38. Is water fluoridation effective? .....	16
39. How does fluoride work to reduce tooth decay? .....	16
40. Is water fluoridation effective in preventing root caries? .....	16
41. Does water fluoridation reduce tooth decay in both children and adults?.....	16
42. What happens if water fluoridation is discontinued?.....	16
43. With other forms of fluoride available, is water fluoridation still an effective method for preventing tooth decay?.....	17
44. What is the "halo" or "diffusion" effect of water fluoridation? .....	17
45. Is fluoridated milk an effective alternative to water fluoridation? .....	17
46. Is fluoridated salt an effective alternative to water fluoridation?.....	17
<b>Safety .....</b>	<b>18</b>
47. Is water fluoridation safe at the recommended level?.....	18

48. Should I be worried about fluoride in my drinking water? .....	18
49. Is fluoride in my drinking water a toxic substance? .....	18
50. Does fluoridated water, at the recommended optimal level, leach out large amounts of aluminum in aluminum cook ware? .....	18
51. Will the long term effects of drinking fluoridated water at optimal levels be harmful to my health? .....	19
52. Is there an association between water fluoridation and heart disease? .....	19
53. Does water fluoridation cause Acquired Immune Deficiency Syndrome (AIDS)? .....	19
54. Does water fluoridation cause allergic reactions or harm my immune function? .....	19
55. Does water fluoridation cause Alzheimer's disease? .....	19
56. Is there an association between water fluoridation and birth defects? .....	19
57. Is there an association between water fluoridation and hip fractures? .....	20
58. Does water fluoridation, at optimal levels cause, or worsen, osteoporosis? .....	20
59. Is there an association between water fluoridation and skeletal fluorosis? .....	20
60. Does water fluoridation cause cancer? .....	20
61. Does the ingestion of optimally fluoridated water affect thyroid gland function? .....	20
62. Does consumption of fluoridated water harm the kidneys? .....	21
63. Does fluoridated drinking water, at optimal levels, adversely affect people with severe kidney dysfunction? .....	21
64. Does water fluoridation cause an increase in the incidence of Down syndrome? .....	21
65. Does fluoride at optimal levels in drinking water irritate, or damage, the stomach lining? .....	21
66. Does water fluoridation cause genetic damage? .....	21
67. Does water fluoridation, at optimal levels, affect brain function or intelligence quotient (IQ) levels? .....	22
68. Is there an association between water fluoridation and adverse effects on reproduction, fertility or birth rates? .....	22
69. Are certain sub-populations, such as the elderly, individuals with cardiovascular and kidney problems, and certain ethnicities, more susceptible to fluoride levels in drinking water? .....	22
70. Is it safe to drink fluoridated water while pregnant or breastfeeding? .....	23
71. Is there an association between Sudden Infant Death Syndrome (SIDS) and water fluoridation? .....	23
72. What is dental fluorosis? Should I be concerned about it? .....	23

<b>Public Health .....</b>	<b>24</b>
73. Is tooth decay a public health problem?.....	24
74. Is community water fluoridation a valuable public health intervention? .....	24
75. What is a plebiscite? Have any occurred in Canada regarding community water fluoridation? .....	24
<b>Ethics.....</b>	<b>25</b>
76. Does water fluoridation interfere with my freedom of choice?.....	25
77. Is water fluoridation a form of mass medication? .....	25
78. Does the public support water fluoridation? .....	25
<b>Environment.....</b>	<b>26</b>
79. Is water fluoridation, at optimal levels, harmful to the environment? .....	26
80. Is fluoride, at optimal levels, harmful to fresh water aquatic life? .....	26
<b>Cost .....</b>	<b>27</b>
81. What is the cost to fluoridate a community's water supply? .....	27
82. Is water fluoridation the most cost-effective means of preventing tooth decay? .....	27
<b>Opposition.....</b>	<b>28</b>
83. Is there opposition to water fluoridation?.....	28
84. Is fluoridation a conspiracy? .....	28

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## What is Fluoride?

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### 1. What is fluoride?

The fluoride ion comes from the element fluorine. Fluoride is a naturally occurring mineral found in soil, air, plants, animals and water supplies. Individuals are exposed to small amounts of fluoride by breathing air, drinking water, and eating food. Fluoride is considered a beneficial nutrient based on its proven effects on dental health. Fluorides are frequently added to drinking water supplies and to dental products such as toothpaste, mouth rinses and professionally applied fluorides to prevent dental decay.

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### 2. What type of fluoride is used to fluoridate water?

Fluorosilicic acid is the most commonly used compound for water fluoridation, followed by two additives—sodium fluorosilicate and sodium fluoride.

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### 3. What is the history of water fluoridation?

The history of water fluoridation dates back to the early 1900s when Dr. Frederick McKay, a dentist in Colorado Springs, Colorado, discovered many of his patients exhibited brown staining and mottled enamel on their permanent teeth. He sought to determine the cause of the staining and enamel mottling, along with his colleague Dr. G.V Black. Through their years of research together, Drs. Black and McKay also noticed that individuals exhibiting these brown stains or mottled enamel were also surprisingly resistant to decay.

Following additional studies conducted in the 1930s, it was discovered that high levels of naturally occurring fluoride in the drinking water were causing the mysterious staining. This stain was then labeled “Colorado Brown Stain”, now known as moderate or severe dental fluorosis.

During the 1930s, Dr. H. Trendley Dean, a dental officer of the U.S Public Health Service, collected and analyzed epidemiological data on the geographical distribution and severity of dental fluorosis. Dean and his colleagues discovered that fluoride levels in the drinking water up to 1 ppm were low and revealed signs of very mild dental fluorosis. By 1939, Dr. Gerald J. Cox and his associates published a paper that proposed adding fluoride to drinking water as a means to prevent dental decay.

Further studies refined the relationship between fluoride levels and decay prevention by looking at the role of climate and water consumption. Such research led to the recommendation that fluoride levels in drinking water be established at 0.7 to 1.2 parts per million, depending on the average daily air temperature for each community. At these fluoride levels, the maximum reduction in tooth decay occurred with the minimum risk of dental fluorosis.

In 1945, Grand Rapids, Michigan was the first city in the world to adjust its water fluoride level to 1 ppm, followed by Brantford, Ontario. From 1945 to 1954, clinical trials were conducted to compare the dental and medical results of the fluoridation of Grand Rapids, Michigan with the clinical findings from non-fluoridated Muskegon, Michigan. Similar comparisons were made between fluoridated Brantford, Ontario and non-fluoridated Sarnia, Ontario. Early clinical data were so impressive that other cities began fluoridating before the classic trials were completed.

During the 1950s and 60s in Canada, the following cities began fluoridating their drinking water: Toronto, Halifax, Saskatoon, Oshawa, Pointe-Claire, Dartmouth, Brandon, Dorval and Red Deer. From the mid 1950's to present day, there has been a national effort to implement water fluoridation in all communities that have treated drinking water. The worldwide evidence supporting water fluoridation continues to grow. The Canadian Dental Association, American Dental Association, World Health Organization and the U.S. Public Health Service and its Centers for Disease Control continue to endorse water fluoridation but also continue to monitor health effects of fluoride. Currently throughout the world, over 400 million people in more than 60 countries benefit from water fluoridation.

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#### **4. How does fluoride strengthen the teeth?**

During demineralization of the tooth, acids produced by bacteria diffuse into the enamel (or dentin if exposed), causing a loss of calcium and phosphorus minerals. Dental mineral is readily dissolved by acid unless it can be protected in some way. If fluoride is present surrounding the tooth crystals, it is absorbed into the surface of the enamel crystals acting as a protective mechanism against acid dissolution of the mineral crystals.

There are beneficial effects of fluoride from both topical and systemic exposures. The maximum reduction in dental decay is achieved when fluoride is available pre-eruptively (systemically) for incorporation during all stages of tooth formation and post-eruptively (topically) at the tooth surface.

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## **5. Why do we need water fluoridation?**

The fluoridation of drinking water supplies is a well-accepted measure to protect public health by preventing tooth decay and is strongly supported by scientific evidence. It has been added to public drinking water supplies around the world for more than half a century, as a public health measure.

Adding fluoride to water is the best way to provide fluoride protection to a large number of people at a low cost. The big advantage of water fluoridation is that it benefits all residents in a community, regardless of age, socioeconomic status, education, employment, or dental insurance status. It promotes equality amongst all segments of the population, particularly the underprivileged and the hardest to reach where other preventive measures may be inaccessible.

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## **6. What is the difference between topical fluoride and systemic fluoride?**

Topical fluoride is applied directly to the tooth surface in the mouth. Topical fluoride increases the tooth's resistance to decay by reinforcing the tooth minerals after an acid attack. Examples include: fluoridated toothpaste, fluoride mouth rinses, and fluoride applied in a dental office in the form of gels, varnishes or foams. Systemic fluoride is ingested and absorbed in the body so that it can reach the developing teeth and bones. Systemic fluoride is incorporated into the developing tooth enamel to strengthen the enamel and create a tooth surface which is more resistant to decay. Examples include: fluoridated water, fluoridated salt and fluoridated milk. A combination of both systemic and topical fluoride use may be recommended to obtain maximum decay reducing benefits.

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## **7. Is there a difference between natural fluoride and the “artificial” fluoride used in fluoridating water supplies?**

Fluoride is a mineral found in nature and is not artificially created. The objective of fluoridation is to adjust the existing natural level of fluoride to the recommended level (0.7 ppm) for preventing tooth decay. There is no difference in the decay-reducing effects of naturally occurring fluoride and adjusted fluoride concentrations in community water supplies—the dental benefits are the same, regardless of the source of fluoride.

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### **8. Is fluoride a nutrient?**

Fluoride is considered a non-essential, mineral nutrient. Prevention of chronic disease may be considered to be a factor in deciding essential nutrients for the body. Fluoride is considered a beneficial mineral nutrient for the prevention of dental disease. In a recent report, the WHO lists fluoride as one of the 14 minerals considered important to good health.

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### **9. Is fluoride a fertilizer?**

Fluoride is not a fertilizer. Fluoride is a naturally occurring mineral found in soil, air, plants, animals and water supplies in the environment.

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## Water Fluoridation in Canada

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### **10. What percent of the Canadian population have access to fluoridated water?**

Approximately 42.6 percent of Canada's population, on public water supplies, is receiving water fluoridation. Over 13 million Canadian's are receiving the benefits of water fluoridation, while another 1 percent (270,000 people) has access to naturally fluoridated water.

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### **11. Which large Canadian cities do not fluoridate their water supply?**

As of 2011, the large Canadian cities without water fluoridation are Vancouver, Regina, Montreal and Calgary.

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### **12. Does the federal government regulate water fluoridation in Canada?**

The federal government is not responsible for the regulation of drinking water in Canada. Provincial and territorial governments regulate the quality of drinking water in their jurisdiction. The fluoridation of drinking water supplies is a decision that is made by each municipality, in collaboration with the appropriate provincial or territorial authority. This decision is often taken in consultation with residents through a referendum.

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### **13. Why is the optimal level of fluoride different from the Maximum Acceptable Concentration (MAC) guideline for drinking water?**

The drinking water guidelines differ because they have different purposes. The recommended optimal level of 0.7 mg/L is set to promote public health benefits of fluoride for preventing tooth decay while minimizing the chance for dental fluorosis. The Guidelines for Canadian Drinking Water Quality, published by Health Canada, states the maximum acceptable concentration of fluoride in public water supplies is 1.5 mg/L to protect against health risks from exposure to too much fluoride.

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**14. Do fluoride compounds in community water fluoridation meet national standards?**

Health Canada does not regulate fluoride compounds for use in drinking water fluoridation, but recommends that drinking water materials (including drinking water additives) be certified as meeting the appropriate NSF standard. The certification process ensures the safety and efficacy of products. The adoption and enforcement of regulatory requirements falls within the mandate of the individual provincial and territorial governments.

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**15. Does Health Canada support community water fluoridation?**

Health Canada endorses water fluoridation as a public health measure to prevent dental decay. The use of drinking water fluoridation in the prevention of dental cavities continues to be endorsed by over 90 national and international professional health organizations, including Health Canada.

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## Fluoride Internationally

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### **16. Is community water fluoridation accepted internationally?**

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.

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### **17. Are there countries that have “banned” fluoridation?**

Fluoridation has not been banned in any country. There are a number of countries that do not fluoride their water supplies; however, failure to fluoridate should not be misconstrued as concern over safety or effectiveness. Some countries have simply not implemented a fluoridation system for a variety of technical, legal, financial or political reasons. In many parts of the world, fluoridation is not feasible for several reasons; lack of a central water supply, the presence of more urgent health needs and the lack of sufficient funds for startup and maintenance costs.

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### **18. Who supports water fluoridation?**

Water fluoridation is supported locally, nationally and internationally by major medical, dental, and health organizations for the prevention of tooth decay. In fact, the use of fluoride for the prevention of dental decay continues to be endorsed by over 90 national and international professional organizations including Health Canada, the Canadian Dental Association, the Canadian Dental Hygienists Association, the Canadian Medical Association, American Dental Association, and the World Health Organization.

Thousands of studies on fluoride and community water fluoridation have been conducted in the last 60 years. There has been continual monitoring of this scientific literature by the world's major national and international health organizations, committees of experts and special councils of governments. To date, the results of these reviews reaffirm that water fluoridation, at the recommended level, is safe, effective and does not pose a risk for health problems.

Below is a list of some of the leading organizations in support of water fluoridation (as of October 2011):

Alberta Dental Association  
American Academy of Pediatrics  
American Association for Dental Research  
American Association of Public Health Dentistry  
American College of Dentists  
American Council on Science and Health  
American Dental Assistants Association  
American Dental Association  
American Dental Hygienists Association  
American Dietetic Association  
American Medical Association  
American Pharmaceutical Association  
American Public Health Association  
Association of State and Territorial Dental Directors  
Association of State and Territorial Health Officials  
Australian Dental Association  
British Dental Association  
British Medical Association  
Calgary & District Dental Society  
Canadian Association of Public Health Dentistry  
Canadian Dental Association  
Canadian Dental Hygienists Association  
Canadian Medical Association  
Canadian Nurses Association  
Canadian Paediatric Society  
Canadian Public Health Association  
Centers for Disease Control and Prevention  
European Organization for Caries Research  
Federation Dentaire Internationale  
Health Canada  
Indian Health Service  
International Association for Dental Research  
L'Association des dentistes en santé publique du Québec  
L'Association des pédiatres du Québec  
L'Hôpital de Montréal pour enfants  
L'Hôpital Ste-Justine pour enfants  
L'Ordre des dentistes du Québec  
L'Ordre des hygiénistes dentaires du Québec  
L'Ordre des pharmaciens du Québec  
La Direction de la santé publique de Montréal  
La Faculté de médecine dentaire de l'Université McGill

La Fédération des médecins omnipraticiens du Québec  
La table de concertation des hygiénistes dentaires en santé communautaire des  
régions de Montréal, Laval, Laurentides et Lanaudière  
Le Collège des médecins du Québec  
Mayo Clinic  
National Health and Medical Research Council  
National Institute of Dental Research  
Ontario Association for Public Health Dentistry  
Ontario Medical Association  
Ontario Dental Association  
Pan American Health Organization  
Public Health Ontario  
Royal College of Dental Surgeons  
UK Department of Health  
World Health Organization

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## **19. What do health organizations and agencies say about water fluoridation?**

Below are the links to many national and international health organizations' positions on water fluoridation:

Health Canada

Office of the Chief Dental Officer

<http://www.hc-sc.gc.ca/ahc-asc/branch-dirgen/fnihb-dgspni/ocdo-bdc/index-eng.php>

Canadian Dental Association (CDA)

CDA's Position on the Use of Fluorides in Caries Prevention, revised April 2010.

[http://www.cda-adc.ca/files/position\\_statements/Fluorides-English-2010-06-08.pdf](http://www.cda-adc.ca/files/position_statements/Fluorides-English-2010-06-08.pdf)

Canadian Dental Hygienists Association (CDHA)

CDHA Position Statement: Community Water Fluoridation, September 2011

[http://www.cdha.ca/AM/Template.cfm?Section=News\\_and\\_Events&Template=/CM/ContentDisplay.cfm&CONTENTID=10805](http://www.cdha.ca/AM/Template.cfm?Section=News_and_Events&Template=/CM/ContentDisplay.cfm&CONTENTID=10805)

Canadian Paediatric Society (CPS)

Position Statement on the Use of Fluoride in Infants and Children

<http://www.cps.ca/english/statements/N/n02-01.htm>

Canadian Public Health Association (CPHA)

Fight the Good Fight: Fluoridation of Drinking Water, 2010

<http://cpa100.ca/12-great-achievements/fighting-good-fight-fluoridation-drinking-water>

Ontario Medical Association

Ontario's Doctors Set the Record Straight on Fluoride in Drinking Water, October 2010

<https://www.oma.org/Mediaroom/PressReleases/Pages/OntariosDoctorsSetTheRecordStraightOnFluorideInDrinkingWater.aspx>

Ordre des dentistes du Québec

Position of the Ordre des dentistes du Québec on Water Fluoridation

<http://www.odq.qc.ca/Publications/PoliciesGuidelinesandPositionstatements/tabid/321/language/en-US/Default.aspx>

Royal College of Dental Surgeons of Ontario (RCDSO)

Policy Statement – Water Fluoridation

[http://www.rcdso.org/pdf/policy\\_statements/policy\\_fluoridation.pdf](http://www.rcdso.org/pdf/policy_statements/policy_fluoridation.pdf)

World Health Organization (WHO)

The World Oral Health Report, 2003

[http://www.who.int/oral\\_health/media/en/orh\\_report03\\_en.pdf](http://www.who.int/oral_health/media/en/orh_report03_en.pdf)

Federation Dentaire Internationale (FDI)

Promoting Dental Health through Water Fluoridation, 2008

[http://www.fdiworldental.org/c/document\\_library/get\\_file?uuid=7c81a88f-2087-447a-954c-d575efea357f&groupId=10157](http://www.fdiworldental.org/c/document_library/get_file?uuid=7c81a88f-2087-447a-954c-d575efea357f&groupId=10157)

American Dental Association (ADA)

Statement on Water Fluoridation and Efficacy and Safety, updated 2002

<http://www.ada.org/2109.aspx>

Centers for Disease Control and Prevention (CDC)

Community Water Fluoridation, reviewed and updated January 7, 2011

<http://www.cdc.gov/fluoridation/>  
<http://www.cdc.gov/fluoridation/benefits.htm#sg>

Surgeon General's Statement on Community Water Fluoridation, 2004

<http://www.cdc.gov/fluoridation/pdf/SGstatement.pdf>

Australian Dental Association

Water Fluoridation Position Statement, April 2007

<http://www.ada.org.au/OralHealth/FLN/flinaust.aspx>

British Medical Association

Fluoridation of Water, January 2010

[http://www.bma.org.uk/health\\_promotion\\_ethics/environmental\\_health/Fluoriwater.jsp](http://www.bma.org.uk/health_promotion_ethics/environmental_health/Fluoriwater.jsp)

National Health and Medical Research Council of Australia

The Efficacy and Safety of Fluoridation 2007

[http://www.nhmrc.gov.au/files\\_nhmrc/file/media/media/rel07/Fluoride\\_Flyer.pdf](http://www.nhmrc.gov.au/files_nhmrc/file/media/media/rel07/Fluoride_Flyer.pdf)

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## Technical

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### **20. How is water fluoridated? What is the process?**

Water fluoridation is the adjustment of the existing natural fluoride level to the recommended levels for healthy teeth. The fluoride compounds used in the adjustment are obtained from the environment. The water treatment plant receives it in the form of a powder or liquid (containing fluoride, hydrogen, and silica—all of which are natural components of our water). The fluoridation process occurs at the water treatment facility, under the careful supervision of the water treatment personnel.

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### **21. Why do we need to fluoridate the water if there are other types of fluoride such as toothpaste, mouth rinses and professionally applied fluorides?**

There are alternative fluoride modalities; however, community water fluoridation is most cost effective and equitable. Community water fluoridation is accessible to the entire community, regardless of socioeconomic status, education, income or race/ethnicity. In addition, research shows that water fluoridation has an effect over and above that of fluoridated toothpaste (and other sources of fluoride).

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### **22. What are the units of measurement for fluoride in water? What does ppm and mg/L stand for?**

Fluoride levels in water can be measured in the following units:

ppm – parts per million

mg/L – milligrams per litre

µg/L – micrograms per litre

1 ppm is 1 part fluoride in 1 million parts water

1 mg/L is 1 milligram of fluoride in 1 litre of water

1 ppm is the same as 1 mg/L. This amount is extremely small. To appreciate how small, think of it compared with other units of measurement.

1 ppm is equivalent to:

- 1 inch in 16 miles
  - 1 minute in 2 years
  - 1 cent in \$10,000
-

### **23. What is the acceptable level of fluoride in drinking water supplies?**

The Canadian guideline for fluoride in drinking water is a Maximum Acceptable Concentration (MAC) of 1.5 mg/L. Exposure to fluoride in drinking water at, or below, this level will not cause any adverse health effects.

The optimal level to promote public health benefits of fluoride for preventing tooth decay, while minimizing the chance for dental fluorosis, is called the optimal concentration, and is well below the MAC. For communities that choose to fluoridate their drinking water, the level of fluoride that is optimal in preventing tooth decay is 0.7 mg/L.

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### **24. What is the optimal level of fluoride in drinking water?**

Health Canada's Chief Dental Officer has reviewed the available science and sought external expert advice from the scientific dental community and has determined the optimal concentration of fluoride in drinking water for dental health to be 0.7 mg/L. Health Canada periodically reviews all current scientific literature to ensure the optimal level of fluoride in water is in accordance with up-to-date science and to set drinking water guidelines in concert with the provinces and territories.

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### **25. Why has the recommended level of fluoride in drinking water changed from a range of 0.8 ppm to 1.2 ppm to a level of 0.7 ppm?**

When the optimal level for fluoridation was first determined more than 60 years ago, the recommended fluoride intake was based mainly on fluoridated water, the principal source of fluoride at the time. Since the time those studies were completed, there has been widespread use of fluoride in toothpastes, mouth rinses, and topical fluoride. In order to account for the availability of fluoride from various sources, over time, the guidelines for the concentration of fluoride in drinking water for optimal oral health have been lowered. Based on its review of the available science, Health Canada has determined that the optimal concentration of fluoride in drinking water should be lowered to 0.7 ppm from a range of 0.8 ppm to 1.0 ppm. This concentration provides optimal dental health benefits and is well below the MAC to protect against adverse health effects.

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### **26. Will the addition of fluoride affect the quality of the drinking water?**

Drinking water is treated to ensure it is safe for human consumption. The addition of fluoride will not change the properties of the water in the distribution system, as the water properties (such as pH level) must be adjusted prior to distribution to meet the Guidelines for Canadian Drinking Water Quality.

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**27. Will the addition of fluoride to my water affect its taste or odor?**

Taste, color and odor are not affected by the addition of fluoride at concentrations found in drinking water. This has been demonstrated in taste tests, with and without fluoride, at concentrations up to 133 ppm of fluoride.

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**28. Does water fluoridation corrode the waterlines in water distribution systems?**

Fluoridation does not cause corrosion of water lines since the addition of fluoride will not change the properties of the water in the distribution system, as the water properties (such as pH) must be adjusted prior to distribution to meet the Guidelines for Canadian Drinking Water Quality.

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**29. Is fluoride in drinking water classified as a drug under the *Food and Drugs Act*?**

Fluoride used in drinking water fluoridation is not considered a drug by Health Canada as per the *Food and Drugs Act* and is not regulated by the federal government as a drug. Fluoride is considered a non-essential mineral nutrient and is beneficial for the prevention of dental disease.

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**30. Can fluoride be removed from the water?**

Fluoride can be removed at both the municipal and residential level through various approaches and technologies. At the residential level, fluoride removal can be achieved by activated alumina filters, distillation or using a reverse osmosis system. Individuals who drink water processed by distillation or reverse osmosis units may not receive the optimal level of fluoride required for the dental decay preventive benefits.

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**31. Will boiling fluoridated water change the amount of fluoride in the water?**

Boiling water will not significantly change the amount of fluoride in the water. When drinking water is boiled, a portion of the water will evaporate and decrease but the total amount of fluoride will remain the same.

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### **32. Is it wasteful to fluoridate the entire water system?**

Compared to alternative methods of preventing tooth decay, fluoridating the entire water supply is most cost effective.

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### **33. What is an individual's average daily fluoride intake?**

The risk assessment approach used by Health Canada to establish drinking water guidelines for fluoride in drinking water includes estimation of the total daily intake of fluoride from all sources of exposure for all age groups.

Health Canada has estimated average intakes of fluoride, from all sources, in the Canadian general population by age group. This can be found at: <http://hc-sc.gc.ca/ewh-semt/pubs/water-eau/2011-fluoride-fluorure/index-eng.php>.

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### **34. Is my child getting an appropriate amount of fluoride from drinking water and tooth paste?**

If you and your child are among the 13 million Canadians who receive their water from an optimally fluoridated community water system, and you follow the Canadian Dental Association's guidelines, then it is highly unlikely that your child is receiving too much fluoride.

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### **35. Once fluoride is ingested, where does it go?**

Approximately 75 to 90 percent of the fluoride we obtain from our diet is absorbed by the gastrointestinal tract. Once absorbed, fluoride is rapidly distributed throughout the body by the blood. As a general rule for healthy adults, approximately 40 percent of the fluoride ingested each day becomes associated with calcified tissues (bones and teeth) within 24 hours, while the remainder is excreted in the urine.

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### **36. Does bottled water contain optimal levels of fluoride?**

The majority of bottled waters on the market do not contain optimal levels (0.7 ppm) of fluoride. Bottled waters can show substantial variation in their fluoride contents. Most bottled waters contain less than 0.3 mg fluoride/L; however, some artesian waters and certain imported mineral waters contain higher levels. Individuals who drink bottled water as their primary source of water could potentially be missing the decay preventive effects of optimally fluoridated water in their community water supply.

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**37. I am feeding my baby formula. How do I know if my baby is getting too much fluoride?**

Current scientific literature does not support a link between consumption of infant formula reconstituted with drinking water containing fluoride and the risk of moderate/severe dental fluorosis. Based on Health Canada's review of the literature, fluoride is not a concern for infants that are exclusively breastfed or consuming ready-to-feed infant formula. Liquid or powdered infant formula can be reconstituted with fluoridated tap water. However, it is advised that individuals living in areas with naturally occurring high levels of fluoride (higher than the guideline of 1.5 mg/L), may want to use a different source of drinking water with a lower fluoride concentration.

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## Efficacy

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### **38. Is water fluoridation effective?**

Water fluoridation is an effective intervention to prevent tooth decay. Since 1997, there have been 18 reviews that have examined water fluoridation, including an expert panel convened by Health Canada in 2007. These reviews have consistently found that fluoridation is effective in reducing the risk of tooth decay, and is the most cost-effective way of providing the benefits of fluoride to communities.

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### **39. How does fluoride work to reduce tooth decay?**

Maximum reduction in dental decay is achieved when fluoride is available both pre-eruptively (systemically) for incorporation during all stages of tooth formation and post-eruptively (topically) at the tooth surface. Water fluoridation provides both types of exposure.

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### **40. Is water fluoridation effective in preventing root caries?**

Research has shown that water fluoridation can reduce root surface decay up to 35 percent in individuals aged 60 years and older with a history of long-term residence (at least 31 years) in optimally fluoridated areas. A 2007 meta-analysis examining the effectiveness of water fluoridation among adults over 40, found that caries rates were higher in non-fluoride groups than in fluoride groups. Fluoride provides lifelong benefits.

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### **41. Does water fluoridation reduce tooth decay in both children and adults?**

Individuals of all ages benefit from the effects of water fluoridation. Tooth decay remains one of the most common diseases affecting substantial numbers of children and adults of all ages and water fluoridation is the most effective and least expensive way to prevent it.

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### **42. What happens if water fluoridation is discontinued?**

Over time, it can be expected that dental decay rates will increase if water fluoridation is discontinued. Since the 1960s, numerous studies have demonstrated the negative impact on dental rates as a result of the discontinuation of water fluoridation.

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**43. With other forms of fluoride available, is water fluoridation still an effective method for preventing tooth decay?**

Water fluoridation is still considered a very effective method for preventing tooth decay in children, adolescents, adults, and seniors. Even in an era with the widespread availability of fluoride from other sources, water fluoridation continues to be effective in reducing dental decay by 30 to 60 percent for children and 15 to 35 percent for adults.

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**44. What is the “halo” or “diffusion” effect of water fluoridation?**

The “halo” or “diffusion” effect occurs when foods and beverages processed in a fluoridated community are consumed in a community without fluoridation. This “diffusion” effect results in an increased fluoride intake, among people in non-fluoridated communities, which provides them increased protection against dental decay.

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**45. Is fluoridated milk an effective alternative to water fluoridation?**

While studies among small sample sizes of children have demonstrated a decrease in dental decay levels as a result of fluoridated milk consumption, these results have not been demonstrated in large-scale surveys. More research is needed before milk fluoridation can be recommended as an alternative to water fluoridation.

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**46. Is fluoridated salt an effective alternative to water fluoridation?**

Salt fluoridation has been shown to be an effective alternative to water fluoridation. The Pan American Health Organization (PAHO), a regional division of the World Health Organization (WHO), has been active in developing strategies to implement caries prevention programmes in the regions of the Americas using both water and salt fluoridation. One concern about using salt as a means to prevent dental decay relates to the issue of mixed public health messages, whereby the promotion of dental benefits of fluoridated salt can be contradictory to public health messages that encourage the reduction of consumption of salt for management of hypertension.

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## Safety

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### **47. Is water fluoridation safe at the recommended level?**

Throughout more than 60 years of research and practical experience, the overwhelming weight of scientific evidence has continuously, and consistently, showed that fluoridation of community water supplies is safe.

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### **48. Should I be worried about fluoride in my drinking water?**

Provided the levels in your drinking water are at, or below, the maximum acceptable concentration of 1.5 mg/L, fluoride in drinking water is safe. Fluoride is a beneficial mineral nutrient that occurs naturally in most sources of drinking water. At low levels in drinking water, fluoride prevents the formation of dental cavities and improves dental health. At levels up to the maximum acceptable concentration of 1.5 mg/L, there are no adverse health effects from fluoride.

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### **49. Is fluoride in my drinking water a toxic substance?**

At levels up to the maximum acceptable concentration, fluoride in drinking water is not toxic. The possibility of adverse health effects from continuous low level consumption of fluoride over long periods has been studied extensively. After more than 60 years of research, scientific evidence indicates that fluoridation of community water supplies is both safe and effective.

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### **50. Does fluoridated water, at the recommended optimal level, leach out large amounts of aluminum in aluminum cook ware?**

Water fluoridation, at the recommended optimal levels, does not leach out large amounts of the aluminum in aluminum cook ware. Leaching of aluminum occurs at extreme (acidic or alkaline) pH levels, levels considered unacceptable for drinking water.

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**51. Will the long term effects of drinking fluoridated water at optimal levels be harmful to my health?**

Since its inception over 60 years ago, there have been thousands of studies that provide evidence supporting the safety and efficacy of water fluoridation. There have been 18 reviews of water fluoridation since 1997, and these reviews, which comprise critical appraisal of research by experts, have found no evidence that fluoridation is associated with cancer, bone disease, kidney disease, birth defects, or other adverse health effects.

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**52. Is there an association between water fluoridation and heart disease?**

There is no evidence of any relationship between the intake of fluoridated water and heart disease. A number of studies have examined mortality in relation to water fluoridation and found that there is no relationship between fluoridation and heart disease death rates.

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**53. Does water fluoridation cause Acquired Immune Deficiency Syndrome (AIDS)?**

There is absolutely no correlation between fluoridation and AIDS. The infectious agent responsible for AIDS has been identified as a retrovirus and designated as the Human Immunodeficiency Virus.

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**54. Does water fluoridation cause allergic reactions or harm my immune function?**

Water fluoridation, at optimal levels, does not cause allergic reactions or interfere with immune function. Comprehensive reviews of the literature confirm that fluoride is not associated with immunotoxicity or reactions of an allergic nature.

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**55. Does water fluoridation cause Alzheimer's disease?**

At this time, scientific evidence does not support a link between fluoridated water and Alzheimer's disease.

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**56. Is there an association between water fluoridation and birth defects?**

Results from comprehensive systematic reviews, including the recent review by Health Canada, have demonstrated that there is no association between fluoridated drinking water and birth abnormalities.

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**57. Is there an association between water fluoridation and hip fractures?**

Current scientific literature does not support a link between exposure to fluoridated drinking water and hip fractures. After dental fluorosis, bone effects are the most studied potential adverse effect of fluoride. Multiple systematic reviews of the scientific literature have validated that there is no association between fluoride in drinking water and hip fractures.

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**58. Does water fluoridation, at optimal levels cause, or worsen, osteoporosis?**

There is no accepted scientific evidence establishing a causal relationship between optimal fluoride consumption and osteoporosis. Exposure to fluoride at concentrations between 1.0–1.5 mg/L have been associated with a positive effect on bone mineral density and high doses, primarily in the form of sodium fluoride, have been used in the treatment of osteoporosis.

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**59. Is there an association between water fluoridation and skeletal fluorosis?**

Skeletal fluorosis is extremely rare in North America and is associated with prolonged exposure to high levels of fluoride in drinking water. It has rarely been documented in Canada. Crippling skeletal fluorosis has been reported in India, Tanzania, South Africa and China where natural fluoride levels in the drinking water contain up to 20 mg/L of fluoride. This amount of fluoride is much higher than the Canadian maximum acceptable concentration (MAC) of 1.5 mg/L.

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**60. Does water fluoridation cause cancer?**

Since community water fluoridation was first introduced in 1945, more than 50 epidemiological studies have been conducted to evaluate the relationship between fluoride concentrations in drinking water and cancer. A number of expert committees, including an expert panel for Health Canada in 2007, have examined the link between fluoride and cancer and have concluded that there is no clear association between water fluoridation and overall cancer incidence or mortality.

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**61. Does the ingestion of optimally fluoridated water affect thyroid gland function?**

Scientific reviews have agreed that the science is insufficient to support an association between exposure to fluoride in drinking water and adverse thyroid effects.

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**62. Does consumption of fluoridated water harm the kidneys?**

Optimally fluoridated drinking water does not harm the kidneys. The Technical Guideline Document on Fluoride prepared by Health Canada in 2010, has recognized that individuals with kidney problems could potentially be more susceptible to the toxic effects of fluoride, however there are no data to suggest that exposure to fluoride at levels found in Canadian drinking water would result in adverse effects in these potentially susceptible individuals.

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**63. Does fluoridated drinking water, at optimal levels, adversely affect people with severe kidney dysfunction?**

While some sub-populations, such as individuals with kidney problems, may be potentially be more susceptible to the toxic effects of fluoride, there are very limited data to support or refute an increased susceptibility to fluoride, and there are no data to suggest that exposure to fluoride at levels below the maximum acceptable concentration of 1.5 mg/L would result in adverse effects in these potentially susceptible populations.

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**64. Does water fluoridation cause an increase in the incidence of Down syndrome?**

The scientific evidence is insufficient to support an association between exposure to fluoride in drinking water and the incidence of Down syndrome. Reviews conducted by international agencies have concluded that the evidence for an association between water fluoride level and the incidence of Down syndrome is weak and of poor quality.

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**65. Does fluoride at optimal levels in drinking water irritate, or damage, the stomach lining?**

Current scientific evidence does not support a link between stomach lining damage and fluoride at levels found in water fluoridation. There have been no reports of gastrointestinal problems in populations exposed to low levels of fluoride found in either naturally occurring or adjusted drinking water.

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**66. Does water fluoridation cause genetic damage?**

Based on the scientific literature, including Health Canada's review of available science, as supported by the Expert Panel on fluoride, the weight of evidence does not support a link between exposure to fluoride in drinking water at 1.5 mg/L and any adverse health effects, including genotoxicity.

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**67. Does water fluoridation, at optimal levels, affect brain function or intelligence quotient (IQ) levels?**

There is no accepted scientific evidence establishing a causal relationship between optimal fluoride consumption and neurological disorders. Studies originating from China that report an association between fluoride and neurological function are heavily flawed in methodology and design and lack appropriate controls. Based on a comprehensive review of available data, the Federal-Provincial-Territorial Committee on Drinking Water have determined that the weight of evidence does not support a link between exposure to fluoride in drinking water at 1.5 mg/L and any adverse health effects, including neurotoxicity and intelligence quotient deficit, as there are significant concerns regarding the available studies, including quality, credibility, and methodological weaknesses.

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**68. Is there an association between water fluoridation and adverse effects on reproduction, fertility or birth rates?**

There is no credible evidence that indicates an association between water fluoridation and human reproduction, fertility or birth rates. Scientific reviews conducted by international agencies, including Health Canada, have examined the link between fluoride and fertility and have concluded that there is no association between water fluoridation and adverse effects on human reproduction.

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**69. Are certain sub-populations, such as the elderly, individuals with cardiovascular and kidney problems, and certain ethnicities, more susceptible to fluoride levels in drinking water?**

There is little evidence of value that certain sub-populations are more susceptible to fluoride at typical levels found in Canadian drinking water. Reviews of the evidence, conducted by the Centers for Disease Control and Prevention, in addition to Health Canada, have concluded that exposure to fluoride at typical levels found in drinking water (e.g. at the maximum acceptable concentration of 1.5 mg/L) do not result in adverse effects in any population.

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**70. Is it safe to drink fluoridated water while pregnant or breastfeeding?**

It is safe to drink optimally fluoridated water while pregnant or breastfeeding. No credible scientific study has linked drinking optimally fluoridated water with birth defects or other reproductive effects. In Canada, the amount of fluoride in formula (ready-to-use, concentrated, and powdered) is regulated by Health Canada to help ensure that infants do not receive too much fluoride in their diet.

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**71. Is there an association between Sudden Infant Death Syndrome (SIDS) and water fluoridation?**

Scientific evidence has demonstrated that exposure to fluoridated water supplies prenatally or postnatally does not affect the risk for Sudden Infant Death Syndrome.

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**72. What is dental fluorosis? Should I be concerned about it?**

Dental fluorosis is an alteration in the appearance of the teeth caused by a change in enamel formation, which occurs during tooth development related to the ingestion of higher than optimal levels of fluoride. The most universally accepted classification of dental fluorosis is the one developed by H.T Dean in 1942 that classifies fluorosis severity from questionable to severe.

Questionable, very mild, mild and moderate dental fluorosis have no effect on tooth function. In fact, questionable, very mild and mild fluorosis may actually make the tooth more resistant to decay. These types of fluorosis are not readily noticeable to the affected individual or the casual observer and often require a trained dental professional to detect. The moderate and severe types of fluorosis are easier to detect.

The actual prevalence of moderate dental fluorosis in Canada is low, and all evidence suggests that since 1996 there has been an overall decreasing trend of moderate dental fluorosis in Canada. Findings from the Canadian Health Measures Survey demonstrated that so few Canadian children experience moderate or severe dental fluorosis, that the prevalence was too low to allow reporting.

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## Public Health

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### **73. Is tooth decay a public health problem?**

Tooth decay remains one of the most common diseases affecting substantial numbers of children and adults of all ages. The consequences of tooth decay include pain, infection, premature tooth loss and misaligned teeth. Complications interfere with children's development and the quality of life of those affected. Importantly, tooth decay is a costly disease. In 2009, dental services in Canada cost over \$12 billion, an average of \$360 per Canadian.

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### **74. Is community water fluoridation a valuable public health intervention?**

Community water fluoridation serves as an example of an excellent public health initiative. The benefits are readily provided to everyone served by a fluoridated public water system and large groups of people can benefit in a manner that does not discriminate against any group, regardless of age, race, gender, ethnicity, religion, education, and socioeconomic status. In 1999, the Centers for Disease Control and Prevention named water fluoridation one of ten great public health achievements of the 20<sup>th</sup> century and in 2010, the Canadian Public Health Association named water fluoridation in its list of the 12 greatest public health achievements of the past 100 years.

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### **75. What is a plebiscite? Have any occurred in Canada regarding community water fluoridation?**

A plebiscite is a vote by a group of people about a political issue. Typically, voters are asked to answer yes or no to a particular question. The decision to implement fluoridation rests with municipalities; however, the outcome of municipal plebiscites will depend, in part, on guidelines set in place at the provincial level. Typically, the decision is left to municipal electorates or the community at large, by way of a vote. Over 30 plebiscites or council votes have taken place for the introduction or continuance of fluoridation across various municipalities. The most recent include votes in Toronto, Halton region, Peel region, Hamilton, Toronto, London, Waterloo, Lethbridge and Calgary. All except Calgary and Waterloo voted to maintain community water fluoridation.

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## Ethics

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### **76. Does water fluoridation interfere with my freedom of choice?**

Water fluoridation is one of several examples of public health measures where additives are used to achieve health benefits in a population. The decision to implement fluoridation rests with municipalities; however, the outcome of municipal plebiscites will depend, in part, on guidelines set in place at the provincial level. Typically, the decision is left to municipality electorates or the community at large, by way of a vote.

In countries such as Canada, there is a core set of values which allows for infringement of individual rights in certain instances such as mandatory vaccination, fortification of foods with essential nutrients, routine testing for certain genetic diseases at birth and water fluoridation.

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### **77. Is water fluoridation a form of mass medication?**

Fluoride used in drinking water fluoridation is not considered a drug by Health Canada as per the *Food and Drugs Act* and is not regulated by the federal government as a drug. Fluoride is added to drinking water as a public health measure to protect dental health and prevent or reduce tooth decay.

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### **78. Does the public support water fluoridation?**

According to recent studies, the majority of the Canadian population is supportive of water fluoridation. A poll in Quebec showed over 80 percent of respondents support water fluoridation and another demonstrated over 60 percent of Canadians support the idea of having fluoride added to their local drinking water.

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## Environment

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### **79. Is water fluoridation, at optimal levels, harmful to the environment?**

Comprehensive reviews of the literature evaluating the impact of water fluoridation on the environment have concluded that there are absolutely no negative environmental effects as a result of water fluoridation.

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### **80. Is fluoride, at optimal levels, harmful to fresh water aquatic life?**

At optimal levels of fluoride, fluoride is not harmful to fresh water or marine aquatic life. Although fluoridated drinking water is eventually released into surface waters, treatment processes and/or dilution of the effluent reduces the concentrations of fluorides to the source water level, typically less than the freshwater aquatic life guideline of 0.12 mg/L. To date, monitoring data from Environment Canada suggest fluoride levels are highly unlikely to be affecting fish and fish habitat. In addition, current monitoring data do not suggest fluoride is influencing the migration patterns or affecting some marine species such as Pacific Salmon.

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## Cost

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### **81. What is the cost to fluoridate a community's water supply?**

The cost of community water fluoridation varies in each community depending on a number of factors, which include the size of the community, number of fluoride injection points, amount and type of equipment used, its price and cost for transportation/storage and expertise of personnel at the water plant. It can be estimated from current cost analyses data that the annual cost to fluoridate a Canadian community ranges from approximately \$0.77 to \$4 per person per year.

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### **82. Is water fluoridation the most cost-effective means of preventing tooth decay?**

Water fluoridation is the most economical method to reduce the burden of dental disease in the population. Given that the annual cost to fluoridate a Canadian community ranges from approximately \$0.77 to \$4 per person per year, the average lifetime cost per person to fluoridate a water system is less than the cost of one dental filling.

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## Opposition

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### **83. Is there opposition to water fluoridation?**

Even though water fluoridation is supported locally, nationally and internationally by the major medical, dental and health organizations for the prevention of tooth decay, there is still a small vocal minority who opposes fluoridation.

Opposition to water fluoridation exists for many shifting reasons. Some of these reasons are philosophical, such as the argument for freedom of choice, or environmental, economic and some are because opponents are simply misinformed.

Opposition towards the views of public health practitioners by minority groups is not restricted to the debate over water fluoridation. Parallels can be drawn with other public health controversies such as child immunizations or the use of genetically modified foods.

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### **84. Is fluoridation a conspiracy?**

Fluoridation is not a conspiracy but rather a recognized public health intervention implemented to reduce dental decay. A vast body of scientific evidence endorses water fluoridation as safe and effective for the purpose of reducing the incidence of dental decay. Support for fluoridation among scientists and health professionals continue, with over 60 years of practical experience. Claims to the contrary are misleading because they evade the systematic reviews and the most important evidence.



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