

Community Water Fluoridation

The whole tooth and nothing but the
tooth...

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OUTLINE

- Background
- The Consequences of Poor Oral Health
- The Case for Water Fluoridation
- Summary and Conclusion

BACKGROUND

OVERVIEW

- Water fluoridation is the controlled addition of the FLUORIDE into a community water supply.
- The purpose of water fluoridation is to prevent tooth decay and help residents retain their teeth throughout life.
- It is an ideal public health method because it is effective, safe, inexpensive, requires no cooperative effort or direct action, and does not depend on access or availability of professional services.
- It is equitable because the entire population benefits regardless of financial resources.

Brief History of Fluoride

- 1900's early observations of dental fluorosis
- 1930's epidemiological studies linking fluorosis, low decay and fluoride
- January 1945 – Grand Rapids, Michigan became the first city to fluoridate its water supply
- June 1945 – Brantford, Ontario became the first Canadian city to fluoridate its water supply
- Over 60 years of adding fluoride to the existing levels to bring it therapeutic level

How Does Fluoride Work?

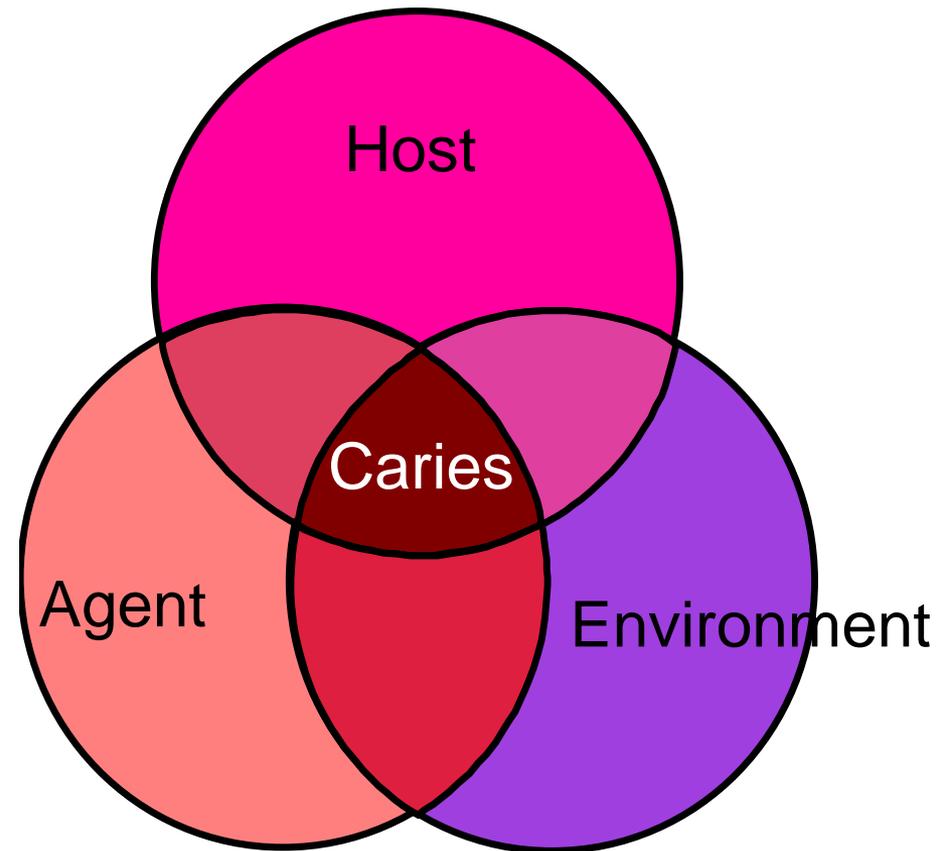
There are two ways that fluoride protects the teeth. Water fluoridation does both.

The first method of fluoride delivery is through topical methods.

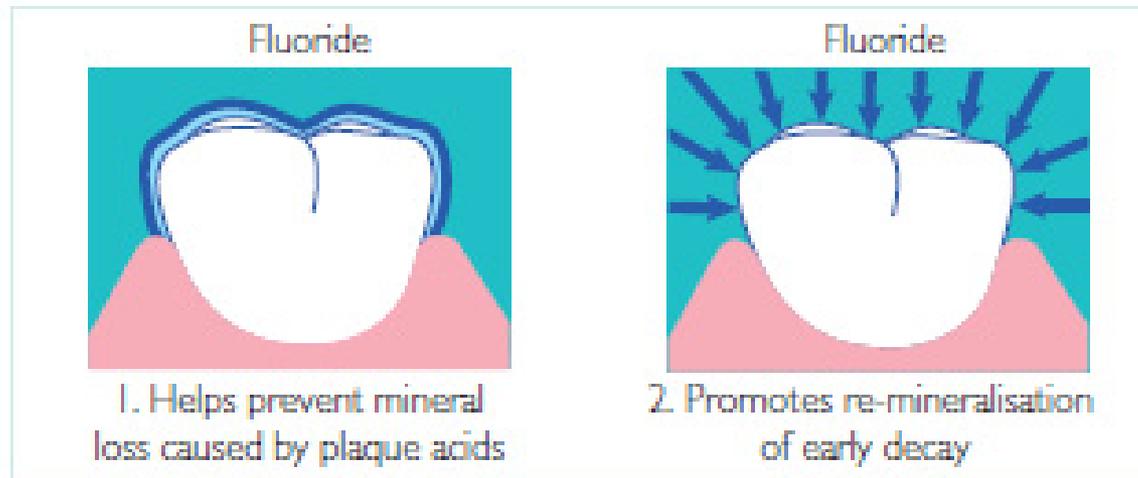
The second is systemically where fluoride is ingested into the body and is incorporated into the tooth structures.

Dental caries

- Multi-factorial disease
 - Requires multiple preventive approaches
- Infectious disease
 - Agent- bacteria- Strep. Mutans
- Susceptible host
 - Teeth- demineralized
- Conducive environment
 - Diet- carbohydrates- sugars



- The consumption of fluoridated water provides both systemic fluoride exposure to developing teeth and frequent topical exposure to erupted teeth, promoting remineralization of early caries among persons of all ages.
- Fluoride also inhibits plaque bacteria.



**Fluoride works best to prevent and control
dental caries
when a small amount
is constantly present in the
oral cavity.**

The goal of any fluoride program is thus to achieve and maintain this status through frequent exposure to low-concentration fluorides: toothpastes, drinking water, fluoridated salt, and rinses.

Brian Burt

FLUORIDE IN NATURE

- 13th most common element
- Naturally occurring mineral present in small but widely varying amounts in almost all soil, water supplies, plants and animals.
- So, fluoride is a normal constituent in our diets.
- Fluoride is excreted from our bodies by the kidneys. Minute amounts are deposited in teeth and bones to strengthen the tissue.

FLUORIDE IN NATURE

- Water with optimal or higher levels of fluoride occurs naturally in many cities.
- In places where water fluoridation is not feasible, such as Europe, they may choose to fluoridate salt or milk instead.
- Therefore, water fluoridation may not be necessary in every region.

NATURALLY OCCURRING FLUORIDE

COUNTRY	NATURAL LEVELS OF FLUORIDE
Turkey	0.7 – 12.5 PPM
Cyprus	0.01 – 2 PPM
Czech Republic	0.05 – 3 PPM
Finland	0.01 – 3 PPM
The Netherlands	0.04 – 0.23 PPM
Poland	0.02 – 3 PPM
Estonia	0.7 – 7 PPM
Denmark	1.1 PPM
Sweden	0.8 – 1.2 PPM
Latvia	0.17 – 1.09 PPM



FLUORIDE INTAKE

- Foods contain varying amounts of the fluoride ion.
- Scientists and experts took into account all the sources of human ingestion when determining the optimal level of fluoride in drinking water.
- $\frac{1}{3}$ of daily intake is estimated to come from foods; $\frac{2}{3}$ from beverages.

FOODS

F CONCENTRATION (PPM)

AVERAGE

RANGE**

• Dairy Products	0.25	0.02 -- 0.82
• Meat, Fish, Poultry	0.22	0.04 -- 0.51
• Grains and Cereals	0.42	0.08 -- 2.01
• Potatoes	0.49	0.21 -- 0.84
• Leafy Vegetables	0.27	0.08 -- 0.70
• Legume Vegetables	0.53	0.49 -- 0.58
• Root Vegetables	0.38	0.27 -- 0.48
• Fruits	0.06	0.02-- 0.08
• Oils and Fats	0.25	0.02 -- 0.44
• Sugars and Adjuncts	0.28	0.02 -- 0.78
• Beverages	0.76	0.02 -- 2.74
• Non Classifiable*	0.59	0.29 - -0.87

• *Soups, Puddings etc.

• **Range depends on whether F water is used in processing, preparation or cooking.

THE CONSEQUENCES OF POOR ORAL HEALTH

TOOTH DECAY

Dental caries (tooth decay) is the single most common chronic childhood disease



- Infection
- Extreme pain
- Difficulty in chewing
- Poor weight gain
- Difficulty concentrating
- Crooked teeth
- Missed school hours
- Predictor of caries in later life
- Costly treatment

HIGH PROFILE SURGERIES

Paediatric Dental Extraction

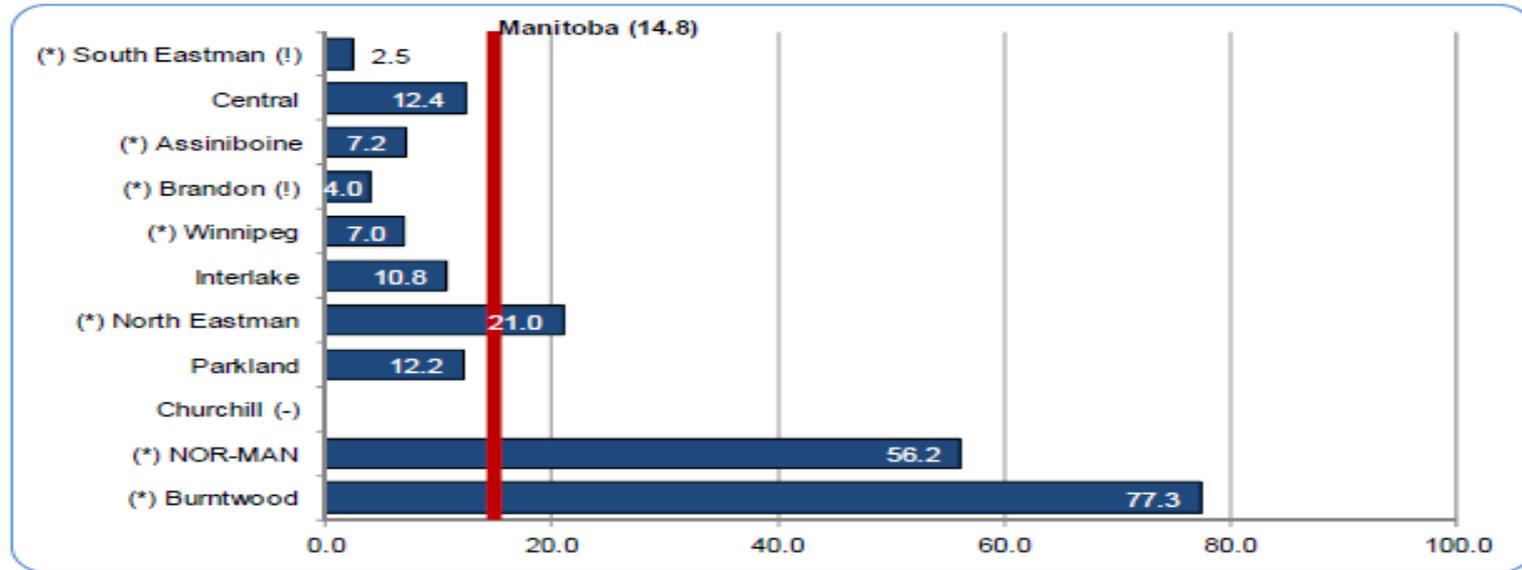


Figure 58: Age- and sex-adjusted rate of dental extraction for children under the age of six per 1,000 children under the age of six by RHA, 2010/2011

Figure 58 shows the age- and sex-adjusted rate of dental extractions among Manitoba children under the age of six by RHA of residence.

In 2010/2011, there were 1,388 hospitalizations for dental extractions among Manitoba children under the age of six, representing a rate of 14.8

hospitalizations per 1,000 children. The age- and sex-adjusted hospitalization rates in Burntwood, NOR-MAN and North Eastman RHAs were significantly higher than Manitoba overall, with Burntwood RHA having a hospitalization rate 5 times that of the rate in Manitoba.

BENEFITS TO OVERALL HEALTH

- Overall health is linked to good oral health.
- Oral care is often overlooked when identifying indicators for overall health status.
- While research in this area is limited, there is now evidence to suggest that oral diseases can be correlated with some chronic diseases such as diabetes, respiratory diseases, cardiovascular disease, and low birth weight.

PREVENTIVE PROTOCOLS

- Prevention and promotion *CAN* reduce disease.
- Fluoride is a preventive measure that is used to eliminate dental decay in conjunction with:
 - Brushing
 - Flossing
 - A healthy diet
 - Regular dental visits
- Dental diseases are mostly preventable.

THE CASE FOR WATER FLUORIDATION

WHY WATER FLUORIDATION?

- Single most effective intervention.
- Fluoridated communities have 20%-40% less tooth decay.(ADA)
- Saves money: every dollar spent on water fluoridation avoids on average \$38 - \$42 in dental care.(CDC)
- Benefits children and adults.
- Benefits last a lifetime.

Approximate Annual Costs of Alternate Fluoride Delivery Approaches (2008, City of Hamilton Estimates)

- Topical fluoride application twice per year to all high risk individuals:
 - Publicly delivered - \$44.50 per person
 - Delivered by private dentists - \$96.12 per person
- Distribution of tooth pastes and brushes to all members of the population:
 - \$8.50 per person
- Compared to water fluoridation: \$1 per person

CANADIAN FLUORIDE LEVELS

- Health Canada Max. Acceptable Concentration (MAC) is 1.5ppm with an optimal level of 0.7ppm (Health Canada)
- (U.S. MAC is 2.0 - 4.0ppm)
- It is important that full compliance is achieved with monitoring protocols.
- Levels can be controlled because fluoride does not dissipate from water.
- Evidence-based science is continuously used to minimize the risks and maximize the benefits.

How much is 0.7 parts per million?

1 part per million is comparable to:

- **1 drop**  in about **50 litres of water** or about **12 - 4 litre containers.**



- **0.7** parts per million of fluoride is the target level in drinking water for the Community Water Fluoridation Program for oral health benefits.

How much is 0.7 parts per million?

One part per million is also comparable to:

- one penny in \$10,000
- one minute in two years



FLUORIDATION IN MANITOBA

- 41 water treatment systems provide fluoridated water to approximately 84 communities. About 95% of Manitobans served by a public water system have access to fluoridated water.
- Target for optimal fluoride level is 0.7ppm
- Each municipality decides whether to fluoridate or not

THE FLUORIDE PROGRAM

- When a community expresses an interest in fluoridating, the water treatment plant is assessed; water is tested for natural fluoride; recommended equipment is ordered. (ODW)
- Manitoba Health provides grants for CWF equipment. Generally the community pays the supplier and is reimbursed.
- On request Manitoba Health will make presentations to community groups and municipal governments.
- Monitoring is key due to the potential for risk if the high levels are maintained for extended periods of time.
- We rely on the voluntary compliance with the monitoring program and the record to date has been excellent.

DAILY TESTING AND MONITORING

- **A mandatory test is done daily to ensure safety of the system.**
- Each water treatment plant operator submits a bi-weekly composite sample for testing.
 - Composite samples are made up of water from each day's sample.
- Samples are tested and reports sent to Manitoba Health electronically.
 - Operators are notified if their results are outside recommended range.

- Manitoba Health (MH) presents certificates to recognize water treatment plant operators who maintain a high standard of operating efficiency for a fluoridation system.
- In 2010-2011, 15 water treatment plants received excellent certificates and 17 received commendation certificates.

Fluoridation Statistics

Canada

•BC	3.7%
•Alberta	74.7%
•Saskatchewan	36.8%
• Manitoba	69.9%
•Ontario	75.9%
•Quebec	6.4%
•New Brunswick	25.9%
•Nova Scotia	56.8%
•Newfoundland	1.5%
•PEI	23.7%

- Nunavut 0.0%
- NWT 56.4%
- Yukon 0.0%
- Canada 45.1%
- USA >72%
- 2009 Canada survey
 - 63% believed safe
 - 60% believed effective
 - 63% continue to support

*Quinonez, C, Locker, D. Public opinions on community water fluoridation. Can J Public Health. 2009 Mar-Apr;100(2):96-100.

PUBLIC POLICY ON WATER FLUORIDATION

Endorsed by key scientific and professional organizations:

- ❖ Canadian Dental Association
- ❖ Health Canada
- ❖ American Dental Association
- ❖ World Health Organization
- ❖ Center for Disease Control



PUBLIC POLICY ON WATER FLUORIDATION

Endorsed by key scientific and professional organizations:

- ❖ Canadian Dental Hygiene Association
- ❖ Canadian Public Health Association
- ❖ CMA
- ❖ PHAC

And virtually every leading scientific and professional organization in the public health field concerned with oral health

Safety of Fluoride

- The safety aspects of water fluoridation have been extensively studied.
- Toxicity of any substance is typically related to the level of exposure or dose (the amount ingested over a period of time).
- Even substances essential for life like water, oxygen, and salt can be toxic in excess amounts.
- In concentrations used for water fluoridation, fluoride is not toxic or harmful.
- The optimal range of fluoride use for water fluoridation already has a built-in margin of safety that takes into consideration the use of fluoride from other sources.

HEALTH EFFECTS

- Dental fluorosis is the most widely studied adverse effect. Mild and very mild dental fluorosis is not considered an adverse effect. Moderate dental fluorosis is a potential aesthetic concern.
- The 2007-2009 Community Health Measures Survey Oral Health results revealed that moderate to severe dental fluorosis is so low it is unreportable.

HEALTH EFFECTS

- Skeletal fluorosis is the most serious effect with prolonged exposure to high levels of fluoride(8-10ppm daily for many years) in drinking water is more relevant to areas in India, China and Africa.
- Overall, the weight of evidence does not support a link between exposure to fluoride in drinking water and bone fracture, intelligence quotient, skeletal fluorosis, immunotoxicity, reproductive toxicity, genotoxicity or neurotoxicity based on a Maximum Allowable Concentration (MAC) of 1.5 mg/L.

Safety of Fluoride

- 0.7 ppm of drinking water target level in MB

Extrapolating from UK Medical Research Council Report (2002) for toxicity thresholds, at this concentration:

- *Child under 8 would have to drink 15 glasses of water daily for prolonged period to get mild dental fluorosis
- *Child or adult would have to consume 60 glasses daily for prolonged period to get skeletal fluorosis
- *20 kg child would have to drink at least 2400 glasses at one sitting to reach acute lethal dose
- *An adult would have to drink at least 3570 litres at one sitting to reach acute lethal dose

Systematic Review

- Published literature retrieved
- Reviewed for quality
- Summarized by experts
- Results synthesized to draw conclusions by groups of experts
- Whenever systematic reviews consider all of the relevant studies, they have found that water fluoridation is effective, and that it is safe at the levels delivered in drinking water.

Systematic Review of Water Fluoridation. UK/International study, 2000

<http://www.bmj.com/content/321/7265/855.full>

Recommendations for Using Fluoride to Prevent and Control Dental Caries in the United States. US Department of Health and Human Services Centers for Disease Control and Prevention, 2001

<http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5014a1.htm>

A Systematic Review of the Efficacy and Safety of Fluoridation. National Health and Medical Research Council, Australian Government, 2007

<http://www.nhmrc.gov.au/publications/synopses/eh41syn.htm>

Findings and Recommendations of the Fluoride Expert Panel, health Canada, January 2007

<http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/2008-fluoride-fluorure/index-eng.php>

SUMMARY AND CONCLUSION

SUMMARY

- The consequences of poor oral health are well documented, and effect our overall health.
- Fortunately, dental diseases are mostly preventable with adequate preventative measures.
- Water fluoridation is a safe and effective public health measure for a community.
- Manitoba Health, along with many other reputable organizations, supports community water fluoridation.

CONCLUSION

“The big advantage of water fluoridation is that it benefits all residents in a community, regardless of age, socioeconomic status, education, or employment. Health Canada continues to support water fluoridation as a safe, cost effective public health measure, and encourages Canadians to review respected and credible sources of information to reach their own conclusions about water fluoridation.”

Dr. Peter Cooney
Chief Dental Officer of Canada

<http://www.wrha.mb.ca/wave/2011/11/fluoride-facts.php>

<http://www.gov.mb.ca/health/publichealth/environmentalhealth/index.html>

http://manitobadentist.ca/user_assets/Fluoridation%20Sheet.pdf

http://www.cdha.ca/pdfs/profession/fluoride_QA_community_EN.pdf



Thank you.

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