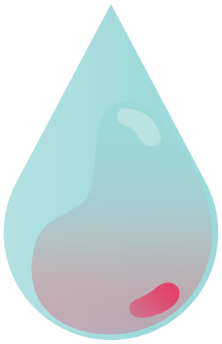
water fluoridation **toolkit**



The importance of water fluoridation on the oral health of **your community**.

Sudbury & District Health Unit
Service de santé publique

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Contents

Introduction

The water fluoridation toolkit contains information important to understanding the benefits of water fluoridation in the community:

- An overview of water fluoridation
- The importance of water fluoridation for oral health
- The effectiveness of water fluoridation
- The safeness of water fluoridation
- The costs of water fluoridation
- Water fluoridation in Greater Sudbury, Sudbury District, and Manitoulin District
- Support for water fluoridation
- Ways to support water fluoridation

1

Overview of community water fluoridation

Definition

Community water fluoridation is the process where fluoride is added to the water supply and adjusted to a level that will optimize dental benefits while avoiding adverse effects.

History

The protective effects of fluoride against tooth decay were first discovered in the 1930s. In January of 1945, Grand Rapids, Michigan, became the first city in the world to fluoridate its water supply. In June of 1945, Brantford, Ontario became the first Canadian city to fluoridate its water supply. Clinical trials were conducted in these communities to examine the effects of fluoridating the water supplies on dental health. Based on impressive preliminary findings that dental health outcomes improved in these communities, many additional cities began fluoridating their water supplies.

Today, water fluoridation is a well-accepted measure to protect public health 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. In 2010, the Canadian Public Health Association identified water fluoridation as one of the 12 greatest public health achievements of the past 100 years.

Why do we need water fluoridation?

Water fluoridation is important for dental health and for overall health. Adding fluoride to the water can protect against tooth decay, which is the most common chronic disease among Canadians. Furthermore, poor oral health has been linked to other chronic diseases such as diabetes and heart disease. Water fluoridation is a protective measure for our health and well-being.

Water fluoridation is the most cost effective and equitable means of providing preventive fluoride protection to the entire community, regardless of socioeconomic status, education, income or race/ethnicity. Community water fluoridation provides the preventive effects of fluoride to individuals who may not be able to afford other types of fluoride, such as toothpaste, mouth rinses, gels, or professional topical fluoride treatments.

Benefits

Water fluoridation protects and promotes dental health which is important for overall health. Specifically, water fluoridation:

- protects against tooth decay;
- provides teeth with constant, low level exposure to fluoride throughout the day and across a lifetime;
- is an effective, safe, economical, and equitable means of preventing tooth decay in a population; and
- is a low cost method to provide fluoride protection, regardless of factors such as age, income, education, employment, or dental insurance status.

2

How water fluoridation protects teeth

Fluoride

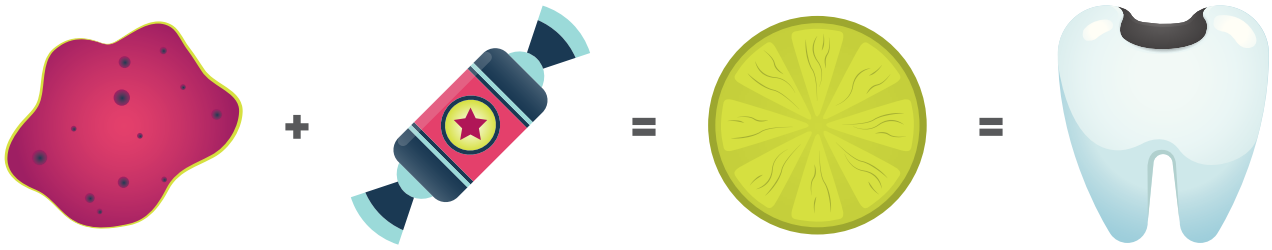
Fluoride is a naturally occurring mineral found in soil, air, plants, animals, and water supplies. Fluoride is considered a beneficial nutrient because of its proven effects on dental health. In a recent report, the World Health Organization lists fluoride as one of the 14 minerals considered important to good health.

Fluoride makes the outer layer of teeth (called tooth enamel) stronger and more resistant to decay (cavities). Fluoride is added to drinking water supplies and to dental products such as toothpaste, mouth rinses, and is professionally applied to teeth to prevent tooth decay.

How cavities form

Cavities (or tooth decay) are caused by bacteria in the mouth. Every day a sticky film called plaque forms on the teeth. Plaque is made up of bacteria and food debris that collects on the teeth. This plaque can lead to cavities if it is not removed through regular brushing and flossing.

Cavities begin when sugar in food and drinks combines with bacteria in plaque and causes acid. Acid weakens tooth enamel by causing mineral loss (demineralization). Repeated acid attacks cause cavities.



bacteria + sugar = acid = cavity

How fluoride protects teeth

Fluoride can both prevent and reverse tooth decay. Fluoride makes teeth more resistant to decay by preventing the mineral loss in tooth enamel that is caused by acids in plaque. In addition, fluoride helps reinforce tooth enamel by promoting the re-mineralization of teeth and reversing early stages of tooth decay.

How water fluoridation protects teeth

fluoride helps prevent mineral loss caused by plaque acids

fluoride promotes re-mineralisation of early decay

Topical vs. systemic fluoride

There are two delivery methods for fluoride. The first, topical fluoride is applied directly to the tooth surface. Topical fluoride increases the tooth's resistance to decay by reinforcing the tooth minerals. Examples include fluoridated toothpastes, fluoride mouth rinses, and fluoride applied in a dental office in the form of gels, varnishes, or foams.

The second delivery method, systemic fluoride, is swallowed and absorbed in the body so that it can reach developing teeth. Systemic fluoride becomes incorporated into developing teeth and strengthens the tooth surfaces so that teeth are more resistant to decay. Systemic fluoride can also combine with saliva in the mouth and continually bathe the teeth with a topical source of fluoride. Sources of systemic fluoride include fluoridated water, fluoridated salt, and fluoridated milk.

A combination of both systemic and topical fluoride is recommended for maximum protection against tooth decay.

How water fluoridation works

Fluoride swallowed in drinking water provides both a topical and systemic source of fluoride. This means that both children and adults benefit from fluoridated drinking water. When young children drink fluoridated water, fluoride is incorporated into the developing tooth enamel to strengthen it and create a tooth surface more resistant to decay.

In addition, fluoridated water provides significant topical benefits for both children and adults when it flows over the teeth.[i] Systemic fluorides provide topical benefits as it becomes integrated in saliva which continually bathes the teeth. Water fluoridation provides teeth with constant, low level exposure to fluoride throughout the day and across the lifespan.

3

Water fluoridation is effective

Does it work?

Water fluoridation is an effective intervention to prevent tooth decay. Since 1997, there have been 18 major 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. Even in an era with the widespread availability of fluoride from other sources, water fluoridation continues to be effective in reducing dental decay.

Who benefits?

Tooth decay remains one of the most common diseases affecting substantial numbers of children and adults of all ages. The beneficial effects of community water fluoridation have been identified in children, adolescents, adults, and seniors.

Children

Tooth decay is the single most common chronic childhood disease. Scientific research proves that fluoridated drinking water greatly reduces the number of cavities in children's teeth, which contributes to their healthy development. A review of past research has shown that water fluoridation can reduce tooth decay in children's primary teeth up to 60% (30 to 60%) and in their permanent teeth up to 35% (15 to 35%).[ii, iii]

Adults

Although the benefits of water fluoridation have been generally associated with children, a review of past research has shown that adults can have up to 35% (15 to 35%) reduction in tooth decay from lifelong exposure to water fluoridation.[iv] In addition, a 2007 meta-analysis examining the effectiveness of water fluoridation among adults over 40, found that, out of the seven studies, all studies showed caries (cavities) rates were higher in non-fluoride groups than in fluoride groups.[v]

Seniors

Root caries, otherwise known as root surface dental decay, is found on the exposed root surface of the tooth near the gum tissue. Root surface decay is increasing as a result of longer retention of teeth and the aging population. Older adults experience more gum recession than other age groups and these exposed roots are at a high risk for decay. Research has shown that water fluoridation can reduce root surface decay in individuals aged 60 years and older with a history of long-term residence in optimally fluoridated areas, and that benefits can be seen for older adults even when exposure to fluoridated water begins in adulthood.[vi]

The community

Adding fluoride to water is the best way to provide fluoride protection to a large number of people at a low cost. The 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 for oral health among all segments of the population, particularly individuals who are underprivileged or difficult to reach with other preventive measures.

Community water fluoridation serves as an example of an excellent public health initiative. The benefits are readily provided to everyone served by a fluoridated water system and large groups of people can benefit in a manner that does not discriminate against any group. 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.

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

4

Water fluoridation is safe

Where does fluoride come from?

Hydrofluorosilicic acid (HSFA) is used to fluoridate drinking water. HSFA is highly corrosive and has several toxic effects in its pure form. However, when HSFA is dissolved in water at very low concentrations, it is no longer the concentrated original substance.[vii] The pH of drinking water, changes the molecular form of the HSFA compound. Therefore, HSFA would be below detection limits and only its ionic components (fluoride ions) would be detectable. These fluoride ions are identical to every other fluoride ion, regardless of the source (e.g., HSFA vs. sodium fluorosilicate vs. sodium fluoride).[viii]

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.

Extensive evidence from published and peer-reviewed literature has disproven claims that fluoridation is associated with cancer, bone disease, kidney disease, birth defects, or other adverse health effects.

Maximum acceptable concentration (MAC) and optimal level

The concentration levels of fluoride used for water fluoridation are safe. Health Canada's guideline for fluoride in drinking water is 1.5 mg/L which is the maximum acceptable concentration (MAC). The MAC is the maximum level of fluoride allowed in drinking water systems. 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. The recommended optimal level of fluoride used in water fluoridation has a built-in margin of safety that takes into consideration other sources with fluoride (e.g., toothpaste, mouth rinses).

Health Canada and other credible organizations continually review the available evidence on the benefits and safety of water fluoridation. The most recent review by Health Canada (2008) concluded that there is no health risk from fluoridation of community drinking water at current levels and that fluoridation continues to be an effective public health strategy to prevent dental disease:

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 (IQ) deficit, as there are significant concerns regarding the relevant studies, including quality, credibility, and methodological weaknesses.[xiv]

Health Canada's Chief Dental Officer reviewed the available science (2008) and sought external expert advice from the scientific dental community through a Fluoride Expert Panel. It was determined that the optimal concentration of fluoride in drinking water for dental health is 0.7 mg/L. The Fluoride Expert Panel's recommended optimal level of 0.7 mg/L is set to promote public health benefits of fluoride for preventing tooth decay while minimizing the risk of dental fluorosis. This concentration provides optimal dental health benefits and is well below the MAC to protect against fluorosis. Health Canada periodically reviews all current scientific literature to ensure the optimal level of fluoride in water is according to up-to-date science and to set drinking water guidelines in concert with the provinces and territories.

Studies have also found that water fluoridation is safe for the environment, and poses no risk to plants or animals.

There is much misinformation about fluoride, including its potential to cause serious health problems such as cancer and skeletal fluorosis.

Cancer

Water fluoridation does not 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.[ix, x, xi]

The International Agency for Research on Cancer has classified fluoride in Group 3: inadequate evidence in humans and inadequate or limited in animals to conclude that fluoride is carcinogenic.[xii]

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 MAC of 1.5 mg/L.

Dental fluorosis

Dental fluorosis is the most widely and frequently studied of all adverse effects of fluoride. It occurs when a child receives too much fluoride during tooth development. Mild and very mild dental fluorosis may appear as white stains on the teeth but does not affect tooth function. Moderate dental fluorosis is considered an adverse effect based on its potential aesthetic or cosmetic concern only.

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. In Ontario, the greatest risk for dental fluorosis is from the ingestion of toothpaste by children.

Regulation

The water fluoridation process is carefully monitored and controlled. Fluoride levels in Ontario are regulated under the Safe Drinking Water Act and the Fluoridation Act. Fluoride additives must meet rigorous standards of quality and purity.

Occupational health and safety

Municipal drinking water systems in Ontario must be operated and maintained by licensed operators and are inspected annually by the Ministry of Environment. All operators are trained to safely handle all chemicals used for water treatment.

Interpreting the evidence

Opposition to water fluoridation has always existed, in spite of the extensive scientific evidence available supporting this practice. Misinformation, anecdotal evidence, or misinterpretation of data/study results continues to circulate and generate controversy. These arguments are not based on sound scientific methodology.

It is necessary to explore all of the available evidence when assessing the safety and effectiveness of water fluoridation. Reviews of the literature must be conducted using standardized scientific methods. Results of individual studies cannot be used to draw firm conclusions.

Selective reviews of scientific studies have been conducted to attempt to show that fluoride is not effective and/or not safe. These reviews aim to prove certain points by citing studies supporting those points. To do so, selective reviews ignore a significant majority of the studies.

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 Ontario.

5

What does it all cost?

Water fluoridation is the most economical method to reduce the burden of dental disease in the population. 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 and 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.

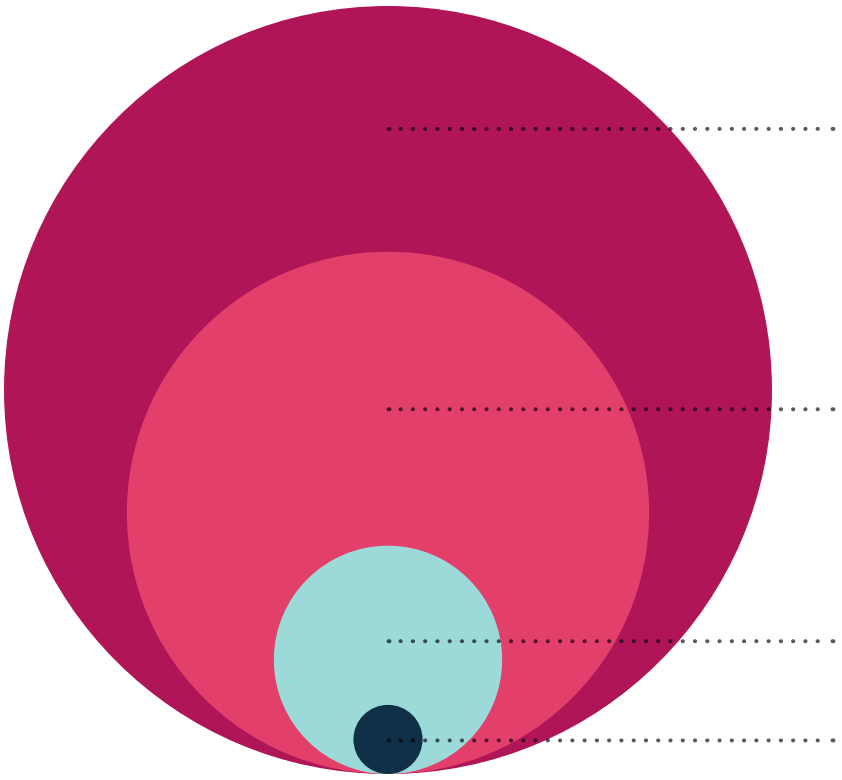
Water fluoridation is the most cost-effective method of preventing tooth decay. School-based dental prevention activities, professionally applied topical fluorides and dental health education are not as cost-effective in preventing dental decay as water fluoridation. The City of Hamilton conducted an analysis of the cost of delivering fluoride through four different methods. The annual costs of alternate fluoride delivery approaches in 2008 are presented in figure 1.[xv]

The cost of treating tooth decay is significantly higher than the cost of preventing it. The cost of adding fluoride to municipal drinking water is minimal when compared to the large costs of restorative dental surgery for children living without fluoridation. The average lifetime cost per person to fluoridate a water system is less than the cost of one dental filling. According to the US Centers for Disease Control and Prevention, for every $1 invested to fluoridate community water supplies, there is an estimated $38 in avoided costs for dental treatment.

The economic importance of fluoridation is emphasized by the fact that the cost of treating dental decay is paid not only by the individual, but also by the general public, through health insurance premiums, health departments and community health clinics. With the escalating costs for health care, fluoridation remains a preventive measure that benefits all members of the community, regardless of socioeconomic status, at a minimal cost.

figure 1

Annual cost per person per preventative measure*



$96.12
topical fluoride applied two times per year to all high risk individuals by private dentists

$44.50
topical fluoride applied two times per year to all high risk individuals by public health services

$8.50
distribution of tooth pastes and tooth brushes to all members of the population

$0.71 - $0.86
water fluoridation

*Based on the City of Hamilton's (2008) analysis of the cost of delivering fluoride through four different methods.

6

Water fluoridation in Greater Sudbury, Sudbury District, and Manitoulin District

Community water fluoridation in Sudbury began over 60 years ago. The former city of Sudbury began water fluoridation in 1952, followed by the Town of Espanola in 1963, and Nairn Township in 1994. Other municipalities of the current city of Greater Sudbury began water fluoridation between 1978 and 1993.

Fluoride is added to the municipal water supply in the range of 0.5-0.8 mg/L. This range meets the legislated limits and is consistent with the recommended optimal level of fluoride to achieve oral health benefits. Certified water treatment operators monitor the water system 24 hours a day and receive alarms when fluoride levels are too high or too low. Automatic and manual shut offs are available in case too much fluoride is added to the water. The Sudbury & District Health Unit (SDHU) works closely with municipalities, where fluoride is added to the community water supply, to monitor fluoride levels and ensure compliance with the Safe Drinking Water Act. Fluoride concentration data are submitted to the Health Unit and reviewed on a monthly basis. Any health-related issues must be reported to the Health Unit.

Community water fluoridation is an economical means of delivering fluoride to members of our community. Adding fluoride to water is the best way to provide fluoride protection to a large number of people at a low cost. Fluoridated water reaches all adults and children and all socioeconomic groups.

Water fluoridation is the most cost-effective method of preventing tooth decay. School-based dental prevention activities, professionally applied topical fluorides and dental health education are not as cost-effective in preventing dental decay as water fluoridation.

The Sudbury & District Board of Health supports water fluoridation. The Board of Health recognizes that water fluoridation is the most cost-effective strategy to prevent dental decay and to ensure that all citizens receive the benefits of reduced dental decay. The Board further recognizes that dental decay is not a benign disease. It causes physical pain. If untreated, it can result in social exclusion and shame. Treating dental decay can cause significant economic hardship.

The SDHU also supports oral health. The Board of Health recognizes the importance of oral health in children, and supports access to urgent care as needed. The Board of Health also ensures children in need of preventative oral health services receive essential clinical preventative oral health services. The service includes dental screening, preventative procedures such as dental cleaning and fluoride treatments, financial assistance, and health promotion activities related to oral health. The SDHU does not provide topical fluoride for ALL children, does not provide dental services for adults, and does not provide a public health dental clinic to the general public.

Greater Sudbury, Sudbury District, and Manitoulin District adults are also in support of fluoridating the water supply. Findings from the 2013 Rapid Risk Factor Surveillance System (RRFSS) indicate that the majority (64%) adults living in Greater Sudbury, Sudbury District, and Manitoulin district were in support of adding fluoride to public drinking water when natural amounts are too low to help prevent tooth decay. Only 23% of those surveyed were opposed to the practice and the remaining 13% were unsure. The results are consistent with those from 2009 and 2010.[xx]

Discontinuing water fluoridation would result in an increase in dental decay in the population. Along with the health-related consequences, increased dental decay would result in increased dental care costs. These costs would affect some people more than others. For example, not all Greater Sudbury, Sudbury District, and Manitoulin District residents have dental insurance. Findings from the 2013/14 Canadian Community Health Survey (CCHS) indicate that around one-quarter (24.8%) of the population in Greater Sudbury, Sudbury District, and Manitoulin District do not have dental insurance and that 39.8% of seniors (ages 65+) do not have such insurance.[xxi] Everyone benefits from the preventive effects of water fluoridation, especially the quarter of the population without dental insurance; water fluoridation is a key defense against painful and stigmatizing dental disease.

7

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 Pediatric Society, the Canadian Dental Hygienists Association, the Canadian Medical Association, the American Dental Association, and the World Health Organization. Many of these professional organizations also have position statements on water fluoridation, which can be found on their websites.

Sudbury & District Board of Health position statement

The Sudbury & District Board of Health and its provincial association, the Association of Local Public Health Agencies, support water fluoridation. The Board of Health recognizes that water fluoridation is the most cost-effective strategy to prevent dental decay and to ensure that all citizens receive the benefits of reduced dental decay. The Board further recognizes that dental decay is not a benign disease. It causes physical pain. If untreated, it can result in social exclusion and shame. Its treatment can cause significant economic hardship. (March 18, 2004)

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. The results of these reviews reaffirm that water fluoridation, at the recommended level, is safe, effective and does not pose a health risk.

8

What can I do to support water fluoridation?

The value of drinking water fluoridation should not be underestimated—it is one of the greatest preventive measures we have in the fight against dental decay. Water fluoridation is an effective public health measure that reduces inequities in health. It helps contain the costs of health care in Ontario. It benefits all residents in a community. At the levels that it is added to drinking water, it is a safe and an effective method to prevent tooth decay.

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 vocal minority that opposes fluoridation. Opposition to fluoridation has existed as long as fluoridation itself, for many shifting reasons. Some of these reasons are philosophical, environmental, or economic, and some are based on misinformation.

Recent debate and discussions about water fluoridation in many Ontario municipalities threaten the continuation of this vital public health measure. Discussions in some municipalities have resulted in the discontinuation of water fluoridation, either through votes by municipal councils or public plebiscites. These decisions have gone against recommendations made by local public health departments and dental professionals.

In order to ensure that our communities continue to benefit from water fluoridation, there is a need to address the myths and misconceptions and to raise awareness about the importance of water fluoridation. The Sudbury & District Health Unit encourages everyone to voice support for community water fluoridation. This can be done by educating clients about the dental health benefits of water fluoridation, and providing them with the Frequently Asked Questions handout included in the Water Fluoridation Toolkit. More information about community water fluoridation including additional copies of the Water Fluoridation Toolkit can be accessed through the SDHU website at www.sdhu.com, or by contacting the SDHU dental team at 705.522.9200, ext. 236.

Frequently asked questions

What is fluoride?

Fluoride is a mineral that is found naturally in most water sources, such as lakes, rivers and the oceans.

What is fluoride used for?

Fluoride makes teeth stronger and prevents tooth decay (cavities). Because of this, fluoride is added to drinking water and other products like toothpaste, mouth wash, salt, and rinses at the dentist.

What is community water fluoridation?

In order to protect your teeth, you need to drink water that has a specific amount of fluoride in it. There is usually not enough fluoride in natural water sources to get the dental benefits. Because of this, many communities add small amounts of fluoride to their drinking water. This means that residents only have to turn on the tap at home, school, work or in their communities to get drinking water that has the right amount of fluoride to help prevent cavities. The amount of fluoride added is controlled, and the water is closely monitored by the operators and by public health to make sure that there is always just the right amount.

Is water fluoridation safe?

Fluoridated water is safe to drink. Community water fluoridation began over 70 years ago, and since then many studies have looked into the safety of drinking fluoridated water. Studies continue to show that there are no risks to your health from drinking fluoridated water at the levels used in community water fluoridation.

Who benefits from water fluoridation?

People of all ages benefit from drinking fluoridated water. Fluoride strengthens teeth and helps prevent cavities whether you are a child, adult or senior. Fluoridated drinking water reaches everyone in a community, regardless of income, age, or education.

Where is the water fluoridated?

The municipal water supply for the City of Sudbury has been fluoridated since 1952. The Town of Espanola began water fluoridation in 1963 and Nairn Township started water fluoridation in 1994. The remaining municipalities of the current City of Greater Sudbury began adding fluoride to the drinking water between 1978 and 1993.

Do I need to drink fluoridated water if I brush my teeth with toothpaste?

Brushing your teeth with fluoridated toothpaste is very important for keeping your teeth healthy. But it is not the only thing you can do. Brushing your teeth AND drinking fluoridated water gives your teeth the maximum protection from tooth decay (cavities). The best way to keep a healthy smile is to drink fluoridated water, brush with fluoridated toothpaste twice a day, floss your teeth, choose healthy snacks, and visit the dentist regularly.

Who supports water fluoridation?

Leading health experts agree that community water fluoridation is a safe and effective way to reduce cavities. More than 90 professional health organizations have endorsed the use of water fluoridation. The US Centers for Disease Control and Prevention has recognized water fluoridation as one of the 10 great public health achievements of the 20th century. Here is a list of just some of the supporters of water fluoridation:

1. Health Canada
2. The Canadian Paediatric Society
3. The Canadian Public Health Association
4. The Canadian Dental Association
5. The Canadian Medical Association
6. The Public Health Agency of Canada
7. The US Centers for Disease Control and Prevention
8. The National Institutes of Health
9. The World Health Organization

Where can I get more information?

Sudbury & District Health Unit
www.sdhu.com

Health Canada
www.hc-sc.gc.ca

Ontario Dental Association
www.oda.on.ca

Canadian Dental Association
www.cda-adc.ca

The US Centers for Disease Control and Prevention
www.cdc.gov

Children's Dental Health Project
www.cdhp.org

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