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HEALTH UNIT

# Fluoridation and Oral Health

**Board of Health**  
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# Outline

- Discovery of fluoride
- How fluoride works
- Benefits and safety
- Treatment versus prevention
- Indicators of oral health and access to dental care

**Main-Group Elements**

1 IA		2 IIA	
1 H hydrogen			
3 Li lithium	4 Be beryllium		
11 Na sodium	12 Mg magnesium		
19 K potassium	20 Ca calcium		
37 Rb rubidium	38 Sr strontium		
55 Cs cesium	56 Ba barium		
87 Fr francium	88 Ra radium		

Atomic number  $Z$   
Symbol  $R_n$   
Name  $radn$

**Main-Group Elements**

13 IIIA					14 IVA		15 VA	16 VIA	17 VIIA	18 VIII A
5 B boron	6 C carbon	7 N nitrogen	8 O oxygen	9 F fluorine	10 Ne neon					
13 Al aluminum	14 Si silicon	15 P phosphorus	16 S sulfur	17 Cl chlorine	18 Ar argon					
31 Ga gallium	32 Ge germanium	33 As arsenic	34 Se selenium	35 Br bromine	36 Kr krypton					
49 In indium	50 Sn tin	51 Sb antimony	52 Te tellurium	53 I iodine	54 Xe xenon					
81 Tl thallium	82 Pb lead	83 Bi bismuth	84 Po polonium	85 At astatine	86 Rn radon					
	114 Fl flerovium			116 Lv livermorium						118 Og oganeson

**Transition Metals**

3 IIIB			4 IVB	5 VB	6 VIB	7 VIIB	8 VIII B			9 IX	10 X	11 IB	12 IIB
21 Sc scandium	22 Ti titanium	23 V vanadium	24 Cr chromium	25 Mn manganese	26 Fe iron	27 Co cobalt	28 Ni nickel	29 Cu copper	30 Zn zinc	31 Ga gallium	32 Ge germanium	33 As arsenic	34 Se selenium
39 Y yttrium	40 Zr zirconium	41 Nb niobium	42 Mo molybdenum	43 Tc technetium	44 Ru ruthenium	45 Rh rhodium	46 Pd palladium	47 Ag silver	48 Cd cadmium	49 In indium	50 Sn tin	51 Sb antimony	52 Te tellurium

**Inner-Transition Metals**

\* Lanthanides

† Actinides

57 La lanthanum	58 Ce cerium	59 Pr praseodymium	60 Nd neodymium	61 Pm promethium	62 Sm samarium	63 Eu europium	64 Gd gadolinium	65 Tb terbium	66 Dy dysprosium	67 Ho holmium	68 Er erbium	69 Tm thulium	70 Yb ytterbium
89 Ac actinium	90 Th thorium	91 Pa protactinium	92 U uranium	93 Np neptunium	94 Pu plutonium	95 Am americium	96 Cm curium	97 Bk berkelium	98 Cf californium	99 Es einsteinium	100 Fm fermium	101 Md mendelevium	102 No nobelium

# Discovery of Fluoride

- Early 1900s - High rates of mottling of teeth (fluorosis) noted in some cities
- 1930s – Fluoride identified as the cause
- Cities with high rates of fluorosis also had little dental decay
- Determined optimal fluoride level to prevent decay with minimal fluorosis – 1 ppm
- Conducted experiment by adjusting fluoride levels in 4 sets of cities

# What Can Fluoride Do?

- Prevents decay
- Causes fluorosis
- At very high levels, skeletal fluorosis which causes bone to be brittle

# How Does Fluoride Work?

- To prevent decay
  - After tooth erupts
  - Incorporated into the tooth as it repairs itself from “acid attacks”
  - Fluoride incorporated into the surface of the tooth makes it more resistant to acid
- Fluorosis
  - Before tooth erupts
  - Less than 6 years of age; 22-26 months highest risk period

# Fluoride Numbers

- 0.5 to 0.8 mg/L (ppm)
- 0.7 mg/L (ppm)
  - Optimal level to adjust fluoride in drinking water
- 1.5 mg/L (ppm)
  - Maximum Acceptable Concentration (MAC) of fluoride in drinking water
  - Between 1.5 and 2.4 mg/L (ppm) raise professional and public awareness to control excess fluoride exposure

# Fortification

- Vitamin D in milk and soy products to support healthy bones and teeth
- Iodine in salt to prevent thyroid disease
- Folic acid in flour to prevent neural tube defects
- Vitamin C in some beverages for healthy tissues

# How Do We Know that Fluoride in Drinking Water is Safe and Effective?

- Systematic reviews of published literature
  - Published literature retrieved
  - Reviewed for quality
  - Summarized by experts
  - Results synthesized to draw conclusions by groups of experts

# Systematic Reviews

- 2000, UK - University of York
  - <http://www.york.ac.uk/inst/crd/fluores.htm>
- 2001, US - Centers for Disease Control and Prevention
  - <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5014a1.htm>
- 2007, Australia - Government of Australia
  - <http://www.nhmrc.gov.au/publications/synopses/eh41syn.htm>
- 2009, Canada - Health Canada – Document for comment
  - <http://www.hc-sc.gc.ca/ewh-semt/consult/2009/fluoride-fluorure/draft-ebauche-eng.php#t4>

# Systematic Reviews Conclude

## Benefit

- Fluoride prevents tooth decay
- Still effective when other sources of fluoride available, although effect less pronounced and so more difficult to detect

## Safety

- Fluorosis
- Evidence does not indicate increased risk of any other health concern including:
  - cancer, impact on IQ, thyroid problems, fractures, skeletal fluorosis

# Fluoride Effective in Other Ages

- Original studies in children
- Adults and elderly prone to root decay
- Studies have demonstrated protection in adults
- More important as adults and seniors keep their teeth

# Fluorosis Prevention

- Maintain fluoride levels in water at or below 0.7 ppm
- No toothpaste or non-fluoridated toothpaste for young children
- After that, pea size amount with parental supervision and spitting out
- No fluoride supplements in the form of pills or drops

# Prevention Versus Treatment

- **Prevention**
- Treatment
  - Pain of cavity
  - Infection from cavity, local or systemic
  - Cosmetic concerns, self esteem issues, chewing problems
  - Procedures, including general anesthesia
  - Lost time from work and school
  - Cost of dental work

# Prevention Particularly Important When Treatment Not Available

# Programs for Children 0-17 Years

- Children in Need of Dental Treatment (CINOT)
  - Urgent needs for low income children
  - \$596,000
- Healthy Smiles Ontario – Began in fall 2010
  - Prevention and treatment for low income children (< \$20,000 net family income)
  - \$870,000
- Ontario Works - Prevention and Treatment
- Prev-OH – at Health Unit Clinic
  - Prevention for low income children 0-17 years
  - \$63,000

# Programs for Adolescents and Adults

- Ontario Works – limited treatment
- Basically no other public programs available
- So need private insurance or ability to pay

# Canadian Health Measures Survey

- Health Canada Survey; 2007 – 2009; 15 locations in Canada
- 5,600 participants; ages 6 to 79 years
- Percent of Canadians with no dental insurance
- 32%
  - 20% higher income
  - 36.5% middle income
  - 50% lower income

## Percent avoiding a dental visit in past year due to cost

- 17%
- 9% high income
- 20% middle income
- 35% low income

# Percent of children who have ever had at least one cavity

## 6 – 11 year olds

- 57%
- 52% higher income
- 61% middle income
- 61% lower income

## 12-19 year olds

- 59%
- 51%
- 58%
- 70%

## Percent brushing teeth at least twice a day

- 73%
- 76% higher income
- 72% middle income
- 66% lower income

## Percent with fluorosis in children ages 6 -12 years

- No severe fluorosis and numbers of moderate fluorosis too low to allow reporting
- 4% mild fluorosis
- 12% very mild fluorosis
- NOTE : mild and very mild fluorosis is generally only noticeable by a dental professional

NOTE: SLIDE MODIFIED ON MARCH 10, 2011 TO PROVIDE MORE DETAILS AND TO CORRECT SMALL INACCURACIES

# Conclusions

- Fluoride reduces tooth decay
- Fluorosis is known risk and rates are low in London due to policies and educational messages
- Evidence does not indicate any other health risk
- No evidence of impact on the environment
- Infrastructure and expertise to adjust fluoride in water are in place and well-established
- Cost is low

# Conclusions

- Access to dental care for low income adolescents and adults is a problem
- Caries rates are higher in children with lower income
- Adjusted fluoride in drinking water provides equitable access to tooth decay prevention regardless of age, socioeconomic status, compliance with dental practices or access to dental care

## Recommendation

*That the Board of Health support the ongoing fluoridation of the City of London's drinking water supply as a measure to achieve optimal dental / oral health for all residents, which is an important component of total health.*

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