Oral Health: The Fluoride Fallacy and Other Clinical Controversies

Annual Review in Family Medicine
December 16, 2014

Support and Disclosure

- Supported by the National Institute for Dental and Craniofacial Research
  - RO3DE165701
  - R21 DE018523
  - U54 DE142501 (CAN-DO I)
- No financial relationships to disclose regarding this topic
Which of the following is not listed as a possible risk of fluoride?

A. Bone cancer (osteosarcoma)  
B. AIDS  
C. Alzheimer disease  
D. Heart disease  
E. Down syndrome  
F. Visual loss  
G. Prostate cancer  
H. Cavities  
I. Hip fractures  
J. Neurodevelopmental delay

Why should you care? CARIES

“It’s just baby teeth”

- Most common chronic disease of childhood
- Cost to child
  - Pain
    - Emergency room visits—20%
  - School loss—117,000 hours of school lost per 100,000 school-age children (Surgeon General’s Report, 2000)
  - Impact on “adult” teeth—greatest likelihood of poor outcome in adulthood when caries in primary teeth
- Systemic health
  - Increased costs/morbidity
Why care about caries?

- Cost to society—over $35 billion national dental bill
  - Employees
  - National Guard Reservists (CA, WA, MA)
  - Throughout lifespan

Why should you care?

- Pt BR, and KM, and GGM, and...

  - Of 1 year olds
    - 89% seen a pediatrician/FP for an “annual exam”
    - 1.5% seen a dentist
    - 6-8% have caries

Fluoride’s mechanism(s)

- Cariostatic
- Enhances tooth (re)mineralization
- Arrests/reverses tooth demineralization
- Inhibits acid-producing bacteria responsible for caries
- Decreases enamel solubility
- Works via saliva and plaque
  - Concentrates in plaque
  - Primarily topical effect, even when given systemically

Dental Decay ≠ Rotting Wood

Early Cavities Can Be Arrested or Reversed

- Improved oral hygiene
- Improved diet
- Fluoride applications
What percent of the US population has access to optimally fluoridated water?

A. 35%
B. 50%
C. 70%
D. 85%
E. 94%

Sources of fluoride

- Natural
  - Mineral, in phosphate rock
  - Naturally dissolves in water—just adjusting level
  - Tea
  - Seafood
- Community fluoridated water
  - ~74% of US population have access
  - Recommended level of 0.7 mg/L
- Toothpaste (range from 0-prescription)
Sources of fluoride

- Other sources
  - Fruits or vegetables sprayed with fluoride pesticide
  - Food boiled in Teflon®
  - Wine
  - Salt and milk (fluoridated) [NOT in US]

Optimal fluoride dose: 0.05 mg/kg/day
1 cup of water ~ 0.25mg

A pea is too much

- “Smear” = 0.1 mg fluoride
  - 1st tooth - 3 years
- “Pea” = 0.25 mg fluoride
  - ≥3 years = Pea
- By parents
- Twice a day
Until at least 6 years, and ...

• Weeks worth of toothpaste!
• ADA recommendations for adults
  – Women ~ 3 mg per day
  – Men ~4 mg per day

Fluoride Supplementation

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Fluoride Concentration in Drinking Water (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0.3</td>
<td>None</td>
</tr>
<tr>
<td>0.3-0.6</td>
<td>0.25 mg/day</td>
</tr>
<tr>
<td>&gt;0.6</td>
<td>None</td>
</tr>
<tr>
<td>Birth to 6 mo</td>
<td>None</td>
</tr>
<tr>
<td>6 mo to 3 yrs</td>
<td>0.25 mg/day</td>
</tr>
<tr>
<td>3-6 yrs</td>
<td>0.5 mg/day</td>
</tr>
<tr>
<td>6-16 yrs</td>
<td>1 mg/day</td>
</tr>
</tbody>
</table>

• If supplementation is recommended, should be taken daily
• Ideally, chew or suck on drops/tablet/lozenge for 1-2 minutes before swallowing

Rozier 2010
Fluoride: more is not always better

- Too much fluoride can hinder development of permanent teeth (if severe fluorosis)

**Fluoride Overdose/Fluorosis**

- **Dental**
  - At risk up to age 8 years (when secondary teeth have erupted)
  - Not for primary teeth b/c mineralized in utero
  - Peak risk
    - Boys, 15-24 mo
    - Girls, 21-30 mo
  - Degrees
    - Mild and moderate fluorosis (98%) considered cosmetic
      - Mild, barely noticeable lacy markings across tooth

**Fluorosis Spectrum**

- Normal
- Questionable
- Very mild
- MMF
- Moderate
- Severe
Graphic prepared by Eugenio Beltran of CDC, from 1999-2004 data for 12-19 yo

Truth to the increased rates of cavities
- Only severe fluorosis causes weakness of enamel

Truth to Skeletal fluorosis, BUT...
- Years to accumulate

Fluorosis rates—fact or fiction?
- Cited by anti-F as 41%
- Pro-F references estimated ~30% total
  - Only 2% severe
    - Only 40-70% of fluoride exposure in high exposure children from community water fluoridation
  - 41% true for adolescents 12-15 in certain areas
  - Rates decline from this age
Bottled Water?

Bottled water and infant formula

• If child exclusively takes infant formula reconstituted with water that contains fluoride, may be an increased chance for mild dental fluorosis
  – Can use low-fluoride bottled water some of the time to mix infant formula
  – Labeled as de-ionized, purified, demineralized, or distilled, unless they specifically list fluoride as an added ingredient (“Baby Water”)
• Weigh risks and benefits

http://www.sierraclub.org/committees/cac/water/bottled_water/

http://www.cdc.gov/fluoridation/faqs/bottled_water.htm
Disparities

- Increased use of bottled water in children of Latino or African American heritage (Gorelick 2011)

Disparity in Access to CWF Rural vs Urban

- Mean present population with access to fluoridated water
  - Urban 72.6%
  - Rural 64.6%
- Dentists per 1,000 population (adults or pediatric provider)
  - Urban 0.51
  - Rural 0.33
- Also, significantly fewer dental visits

The Rest of the World

- Europe
  - Many countries do not fluoridate
    - Austria
    - Belgium
    - France
    - Germany
  - UK—11%
  - Canada

The Rest of the World

- Reasons why
  - Higher rates of health services provision, including dental care
  - Fluoridated salt/milk/other forms
  - Most did not opt for CWF not because rejecting the benefits or science of water fluoridation, but range of other reasons
    - Cost
    - Belief that system is already doing enough
“Precious Bodily Fluids”

Risks--Intelligence

- Studies from China (Cheng 2013; Choi 2012) and rat models, with fluoride levels a minimum of 3 times higher than the highest seen in US
  - Lancet Neurology (Grandjean 2014) – minor reference to fluoride, referencing China studies
  - Ding 2011
- Broadbent et al, AJPH 2014 (released online); controlled for socioeconomic status, breastfeeding, birth weight
  - NO DIFFERENCES

Risks--Fractures

- Research in rats—no difference with females, equivocal with males, with fluoride levels >25 times level in water
- York report, a systematic literature review, showed, of 29 studies looking at incidence of bone fracture and water fluoridation:
  - 4 indicated a significant increased risk
  - 5 indicated a significant decrease in risk
  - 20 found no significant associations
Risks—Fractures—issues with selective data presentation

- Connett [2006, Fluoride Alert] cites study from China [Li 2001]
  - Reported results
    - When people consume water with 1.5 ppm fluoride, hip fractures x2
    - When water greater than 4.3 ppm fluoride, x3
  - Author’s statement
    - Doubling of fractures at 1.5ppm is NS
    - ‘U’ shaped curve between the amount of fluoride in the water and fractures
      - Optimally fluoridated water actually has protective effect on bone fractures

Risks

- Poison
  - Link with sarin gas (isopropyl methyl phosphoryl fluoride)
- Cases with contaminated mouthwash

Risks

- Understanding both sides
- Still, 70 leading health organizations support community water fluoridation
Center for Dental Health www.ilikemyteeth.org

US Preventive Services Task Force

- **Fluoride Supplements (B evidence)**
  - Supplement with fluoride over age 6 months if non-fluoride exposed
    - Should include risk assessment in recommendation
- **Fluoride Varnish (B evidence)**
- **Insufficient** evidence for recommendation that primary care providers, such as family doctors and pediatricians, do routine oral exams

Bright Futures/AAP Risk Assessment Tool

- **Fluoride Varnish**
  - Can and should be applied during well child visits
  - Meaningful Use measure
  - CPT codes
  - Speak to your local COHA (children’s oral health advocate, though AAP) for more information
Diet—very similar to obesity prevention

- No juice/sugar-sweetened beverages
- Limit concentrated carbohydrates (dried fruit vs. lollipop)
- Get off bottle as soon as possible

Substrate

- Carbohydrates → acid → demineralization
- Carbs are carbs are carbs
  - Not all sugars are sweet
- Not just what, but how often (more imp than how much!)

Safe Zone

Danger Zone

Oral Health Care in Pregnancy

- Perceptions: potential of risk from:
  - X-rays
  - Mercury
  - Medication
- Pregnancy related issues
  - Gingivitis (as high as 60-75%)
  - Epulis
  - Caries
  - Erosion
  - Many Strep mutans in vaginal fluid
  - Vertical transmission of Strep mutans

http://www.exodontia.info/Epulides.html
http://www.nypartnersinoralhealth.com/tableofcontents/prenatalcare.html
Dental problems and lack of receipt of dental care during pregnancy among women delivering in California, 2002-2007

- 52% reported dental problems
- 66% did not receive dental care
- 62% of women with dental problems did not receive care

Main reason for not receiving dental care during pregnancy

- 21% financial barriers
- 19% personal barriers
- 38% no perceived need
- 14% read or heard not to go
- 8% provider said not to go
- 19% other reasons

Key findings

- About half of all women reported a dental problem of some sort during pregnancy
- Approximately two-thirds did not receive dental care during pregnancy, even among those reporting a problem
  - Disparities existed by income, education, race/ethnicity
  - Prevalence of no care high even among women with moderate incomes or some college education

Oral Health Care in Pregnancy

- Potential concerns
  - Low birth weight
  - Preterm delivery
  - Transmission to children
What you can do

- Ask
- Assess
- Advise
- Arrange
- Assist

What you can do

- Ask
  - Do you have bleeding gums, toothache, cavities, loose teeth, or other oral issues?
  - Have you had a dental visit within the past 6 months
- Assess
- Advise
  - Dental care is safe, effective, important (and covered)
  - First trimester dx, tx safe
  - Delay in treatment could cause problems
- Arrange
  - Referral lists
- Assist
  - Provide medical clearance if needed

Recommendations for “morning sickness”

- Eat small amount of nutritious yet noncariogenic foods throughout the day
- Use a teaspoon of baking soda (sodium bicarbonate) in a cup of water and rinse after vomiting to neutralize acid
- Chew sugarless or xylitol gum after eating
- Use gentle tooth brushing to prevent damage to demineralized tooth surfaces

Questions that a dentist may ask

- Can I take x-rays?
- Can I inject local anesthesia with epinephrine?
- Can I administer 30% nitrous oxide for analgesia?
- What medications can I prescribe?
- Are topical agents safe?
- When should I perform necessary procedures?
- Can I use mercury restorations?
- How should the pregnant woman be positioned?
Questions that a dentist may ask

- Can I take x-rays?
- Can I inject local anesthesia with epinephrine?

Nitrous oxide use

- The use of nitrous oxide should be limited to cases where topical and local anesthetics are inadequate
- Pregnant women require lower levels of nitrous oxide to achieve sedation
- Conscious sedation should be the last possible alternative in the third trimester

What medications can I prescribe?

- Not tetracycline
- See Drugs in Pregnancy and Lactation

Are topical agents safe?

- Fluoride
  - Toothpaste & mouthrinse
- Xylitol chewing gum
- Chlorhexidine (11% alcohol)
- No over the counter mouthrinses with alcohol (Listerine 20% alcohol)
When should restorations/necessary work be performed?

- Needed treatment should be provided any time
- Second trimester - early 14 to 20 weeks is preferred
- Pre-anesthesia evaluation may require addressing loose teeth and restorations prior to time of delivery

Is it safe to use mercury restorations?

- No evidence of harmful effect
- Benefits outweigh risks
- Canada, Germany, and New Zealand have some restrictions
- Determine the best option

How should the pregnant woman be positioned?

- Flat position may cause hypotension and hypoxia
- Place a small pillow under right hip - left lateral displacement
- Head above feet

What you can do

- Refer!
  - Dentists
  - Support groups (eg, Centering Pregnancy)
Oral Health and Systemic Health

- Inflammatory process
- Costs lowered with preventive care (Jeffcoat)
  - T2D: 40.2%
  - CVD: 40.9%
  - CAD: 10.7%
  - Pregnancy: 73.7%
  - No effect with RA
- Diabetes (Taylor) and regular periodontal services
  - Lower overall medical and pharmacy costs by >10%
  - Diabetes-related medical costs lowered ~19%

Summary

- Oral health problems in children are common and can be severe
- Toothpaste
  - Discourage candy flavored
  - Minimize excessive fluoride by limiting toothpaste to a smear in children under 3
- Water
  - Encourage consumption of water, particularly fluoridated water in high-risk patients
  - Discourage exclusive use of fluoridated water when mixing formula

Summary

- Excess fluoride can cause fluorosis (only ~2% clinically significant); no data to support increased rates of other health problems
- Dental referral at first tooth and in pregnancy
- Oral health care in pregnancy safe
- Oral health care associated with worsened systemic health
  - Care may be cost-saving

References—General “Pro”

- (in press) Fluoride statement from AAP
- Protecting All Children’s Teeth
  http://www2.aap.org/ORALHEALTH/pact/index-cme.cfm
- AAP EQIPP module
- http://www.cdc.gov/fluoridation/
References—General “Pro”


References--General “Anti” (see also risks)

- http://www.fluoridedebate.com/
- Fluoride Action Network http://fluoridealert.org/
- Google

Balanced


References—Fractures

References, cont’d

Risks

Cancer

References – Disparities

References, cont’d

Intelligence
- (pro) Broadbent JM et al. Community Water Fluoridation and Intelligence: Prospective Study in New Zealand. Published online ahead of print May 15, 2014: e1–e5.

Bottled Water
- National Resources Defense Council
  http://www.nrdc.org/water/drinking/qbw.asp

General References for Families
- Michelle Obama’s “Drink Up” campaign
  http://youarewhatyoudrink.org/about/
- Center for Dental Health
  www.likemyteeth.org
• Appreciation to Kristin Hoeft
• Thank you!

Questions?

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