Fluoride Use in Primary Care

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Disclosure Statement

- I have no relevant financial relationships with the manufacturers(s) of any commercial products(s) and/or provider of commercial services discussed in this CME activity.
- I do not intend to discuss an unapproved/investigative use of a commercial product/device in my presentation.
Objectives

• Understand indications for topical fluorides in children

• Learn the types of fluoride products and the appropriate dosage
Background

• Dental caries remains the most common chronic disease of childhood.
• Caries is mostly preventable
• Dental health vs disease is a balance between protective and destructive factors
• Fluoride has proven effectiveness in the prevention of caries
Proposed Mechanisms of Action

- **Systemic** – incorporation into developing tooth enamel (pre-eruptive)
- **Topical** – anti-bacterial
- **Topical** – remineralization of existing tooth enamel (post-eruptive)
Systemic Fluoride

- Community water fluoridation has been recognized as 1 of the top 10 public health achievements of the 20th century by the CDC
- When children born and raised in fluoridated areas move to non-fluoridated areas, the decay-preventive effects largely disappear
- Drinking fluoridated water provides a topical benefit as well as systemic

The Role of Systemic Fluoride

• Prior to writing a prescription you must assess the child’s fluoride intake from all sources
  o Water at home, formula, beverages, water at school or day care facility
  o Is child supervised during tooth brushing?
  o Is child getting a fluoride supplement at school?
Dietary Fluoride Supplements

• Should be considered for children living in a non-fluoridated community or who drink well water

• Status of water fluoridation may be available at: My Water’s Fluoride

• Well water should be tested for fluoride content
  o Usually available through state’s public health laboratory
My Water’s Fluoride

View Water System Information

Search by State  Search by County or Water System

If you do not see your state, then the state is currently not participating in My Water’s Fluoride. States participating in MWF

Select State/Territory: Select  Go

Map of the United States showing states participating and not participating in My Water’s Fluoride.
My Water’s Fluoride

### Florida - List of Counties

Select a county from this list to display the community water systems.

<table>
<thead>
<tr>
<th>67 Counties</th>
<th>67 Counties</th>
<th>67 Counties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alachua</td>
<td>Hamilton</td>
<td>Okeechobee</td>
</tr>
<tr>
<td>Baker</td>
<td>Hardee</td>
<td>Orange</td>
</tr>
<tr>
<td>Bay</td>
<td>Hendry</td>
<td>Osceola</td>
</tr>
<tr>
<td>Bradford</td>
<td>Hernando</td>
<td>Palm Beach</td>
</tr>
<tr>
<td>Brevard</td>
<td>Highlands</td>
<td>Pasco</td>
</tr>
<tr>
<td>Broward</td>
<td>Hillsborough</td>
<td>Pinellas</td>
</tr>
<tr>
<td>Calhoun</td>
<td>Holmes</td>
<td>Polk</td>
</tr>
<tr>
<td>Charlotte</td>
<td>Indian River</td>
<td>Putnam</td>
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<tr>
<td>Citrus</td>
<td>Jackson</td>
<td>Santa Rosa</td>
</tr>
<tr>
<td>Clay</td>
<td>Jefferson</td>
<td>Sarasota</td>
</tr>
<tr>
<td>Collier</td>
<td>Lafayette</td>
<td>Seminole</td>
</tr>
<tr>
<td>Columbia</td>
<td>Lake</td>
<td>St. Johns</td>
</tr>
<tr>
<td>Dade</td>
<td>Lee</td>
<td>St. Lucie</td>
</tr>
<tr>
<td>DeSoto</td>
<td>Leon</td>
<td>Sumter</td>
</tr>
<tr>
<td>Dixie</td>
<td>Levy</td>
<td>Suwannee</td>
</tr>
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</table>
### Orange County Public Water Systems

#### 50 Water Systems Found

<table>
<thead>
<tr>
<th>PWS Name</th>
<th>PWS ID</th>
<th>Fluoridated</th>
</tr>
</thead>
<tbody>
<tr>
<td>APOPKA, CITY OF</td>
<td>FL-3480200</td>
<td>No</td>
</tr>
<tr>
<td>BARTON LAKE MHP</td>
<td>FL-3480061</td>
<td>No</td>
</tr>
<tr>
<td>BIG OAKS MOBILE HOME PARK</td>
<td>FL-3481571</td>
<td>No</td>
</tr>
<tr>
<td>BRIGHTWOOD MANOR MHP</td>
<td>FL-3480114</td>
<td>No</td>
</tr>
<tr>
<td>CLARCONA RESORTS</td>
<td>FL-3481501</td>
<td>No</td>
</tr>
<tr>
<td>COLLEGE MOBILE HOME PARK</td>
<td>FL-3480226</td>
<td>No</td>
</tr>
<tr>
<td>CONESTOGA MOBILE HOME PARK</td>
<td>FL-3481551</td>
<td>No</td>
</tr>
<tr>
<td>CRESCENT HEIGHTS S/D(CONSEC)</td>
<td>FL-3480255</td>
<td>Yes</td>
</tr>
<tr>
<td>DAVIS SHORES (CONSEC)</td>
<td>FL-3480272</td>
<td>Yes</td>
</tr>
<tr>
<td>DE NEEF VILLAGE</td>
<td>FL-3480289</td>
<td>No</td>
</tr>
<tr>
<td>EATONVILLE WATER DEPARTMENT</td>
<td>FL-3480327</td>
<td>Yes</td>
</tr>
</tbody>
</table>
## Supplement Dosage

<table>
<thead>
<tr>
<th>Age</th>
<th>Fluoride Ion Level in Drinking Water (ppm)*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;0.3</td>
</tr>
<tr>
<td>Birth–6 months</td>
<td>None</td>
</tr>
<tr>
<td>6 months–3 years</td>
<td>0.25 mg/day**</td>
</tr>
<tr>
<td>3–6 years</td>
<td>0.50 mg/day</td>
</tr>
<tr>
<td>6–16 years</td>
<td>1.0 mg/day</td>
</tr>
</tbody>
</table>

*1.0 part per million (ppm) = 1 milligram per liter (mg/l)
**2.2 mg sodium fluoride contains 1 mg fluoride ion.

http://www.ada.org/en/member-center/oral-health-topics/fluoride-supplements
Fluoride Supplements

Lozenges
Rx: Sodium fluoride lozenges (0.25 or 0.50 mg F-/lozenge)
Disp: 120 lozenges
Sig: Dissolve one lozenge in mouth daily
Refill: 1
Is there an anti-bacterial benefit

- Evidence suggests that fluoride may inhibit energy and biosynthetic metabolism of oral bacteria
- However, the fluoride concentrations necessary for anti-microbial effects are higher than would be present in the mouth

- Bottom Line: Likely only minor effect
Topical Fluoride Modalities

• Over-the-counter
  o Fluoride toothpaste (1000 ppm)
  o Fluoride rinse

• Professionally applied or prescribed
  o Fluoride varnish
  o High concentration fluoride toothpaste (5000 ppm)
  o Fluoride gel for home use

• Optimally fluoridated drinking water
  o Provides both a topical and systemic benefit
Topical Fluoride

• Strong evidence to suggest that fluoride shifts the equilibrium in the local oral environment towards greater mineralization of tooth structure
  - Enhances remineralization and inhibits demineralization

• Fluoride provides effective caries prevention for all ages

Bottom Line: Main effect of fluoride
Fluoride as a Therapeutic Agent for Dental Caries Prevention

• Given that the main effect of fluoride is topical, localized and direct on erupted (or erupting) teeth, the ideal fluoride regimen is one that provides fluoride exposure on a continuous or high frequency basis.
The Role of Topical Fluorides in Prevention

• Topical fluoride gel, foam and varnish is effective in the remineralization of early carious lesions and in the prevention of new cavities.

• Fluoride varnish is well suited to young children because there is less risk of ingestion and it does not require the use of trays.
Available Fluoride Therapies

**Fluoridated Water:**
- Provides low-dose (0.7-1.0 ppm) fluoride topically on a nearly continuous or high frequency basis for those consuming it alone, or in foods or beverages made with water
  - 1 ppm = 1 mg/liter (~0.24 mg/cup)
- Very effective and low-cost
- Many people do not receive fluoridated tap water
- Bottled water is generally low in fluoride
Available Fluoride Therapies

Fluoride Toothpastes:

• Provides moderate-dose (1000 ppm) fluoride topically on a 2-3 times per day basis for those using it (1 inch on toothbrush is ~ 1mg fluoride/pea size is 0.25mg)
• Very effective, readily available and low cost
• Requires active use (people must brush their teeth to receive benefit)
• Ingestion a concern in younger children
  o Recommend parental supervision
When to use tooth paste?

- Begin to use tooth paste when first tooth erupts
  - Children under 3 years of age – use a smear of toothpaste
  - Children 3 years and older – use a pea-sized amount

- Recommended by AAP, ADA and AAPD

- Tooth brushing & dispensing of tooth paste should be done by parents or with close parental supervision.
The Role of Fluoride Toothpaste in Prevention

- Tooth brushing with fluoridated toothpaste prevents caries
- Decay reducing benefits of fluoride have been extensively documented in the scientific literature
- Most effective time of day to brush is before bed time
Fluoride in Tooth Paste

• Most tooth paste has 1000 ppm fluoride (some has 1500 ppm)

• In U.S. there are no children’s tooth pastes with decreased concentrations of fluoride

• Prevident is a prescription tooth paste with 5000 ppm
  o Recommended for adolescents at increased risk for caries
Available Fluoride Therapies

**Fluoride Mouth Rinses:**
- Provides moderate-dose (226 ppm) fluoride topically on a daily basis for those using it.
- Effective and available OTC
- Requires active use (people must remember to rinse daily)
- Younger children incapable of rinsing & expectorating
Fluoride Rinse

• Available over-the-counter 0.05% NaF

• Not recommended for children under 6 years of age
  o Must be able to swish and spit

• Recommend rinsing daily after brushing and before bed, then NPO

• Can be brushed on a child’s teeth that doesn’t like foaming action of tooth paste
Topical Fluoride Gel

- Requires prescription

- 1.1% NaF (5000 ppm) gel

- Recommended for children over 6 years of age who are at high risk for dental caries

- Brush 1 drop of gel on teeth before bedtime; NPO at least 30 min.
Recommendations

• Avoid fluoride mouth rinses and professionally applied gels in infants and young children due to risk of ingestion.
• Prescribe dietary fluoride supplements for those with deficient water fluoride.
  o Assess caries risk and other fluoride exposures prior to prescribing
• Educate parents about dangers of excess fluoride ingestion.
Available Fluoride Therapies

Professionally Applied Fluoride Varnishes:
- Provides high-dose (22,600 ppm) fluoride topically several times per year
- Effective, under providers’ control and locally retained for several hours
- Small amount used, so less ingestion concern
- Requires professional visit
- More frequent use somewhat impractical and expensive
Fluoride Varnish

- First introduced in Germany in 1964 under the trade name Duraphat
- Over 30 years of clinical study
- Majority of studies have exhibited a 25-45 percent reduction in dental caries
- Reduction in occlusal as well as smooth surface caries
Fluoride Varnish

- Introduced to United States in 1991
- FDA approval as a “cavity liner” and a “desensitizing agent”
- 5% NaF (2.26% F ion)
- Fluoride ingestion lower than with gels
Fluoride Varnish Efficacy

- Average 33% caries reduction with biannual application*
- 43% reduction in decayed, missing, filled teeth compared to placebo**
- Systematic review of topical fluoride studies concluded that there is good evidence to support the use of 5% sodium fluoride varnish in children of all ages.***

*Helfenstein and Steiner, Community Dent Oral Epidemiol, 1994
**Marinho et al, Cochrane database syst rev, 2013
***Weyant et al, JADA, 2014
States with Medicaid funding for physician oral health screening and fluoride varnish

Services Reimbursed in Florida

- Fluoride varnish and Anticipatory Guidance
- Provided by MD, PA or ARNP
  - Can delegate to CAN, LPN, RNA, RN
- Reimbursement: $27
- Code: 99499 with modifier SC (medically necessary)
- Eligible ages: 6-42 months
- Frequency – 4 applications per year

http://www2.aap.org/commpeds/dochs/oralhealth/State.html
Over 17 different brands available
Dry teeth with 2x2 gauze square
Apply varnish to all tooth surfaces
Varnishes vary in color from clear to white or yellowish
Dental Fluorosis

• A permanent, intrinsic stain caused by excessive fluoride ingestion during tooth development
• Staining is usually white, but can be dark brown or orange
• In severe cases, tooth enamel can be damaged
• Can occur in primary or permanent teeth
Fluorosis Risk

• Risk is increased by ingestion of greater than optimal levels of fluoride during tooth development
  o Unsupervised tooth brushing
  o Fluoride supplementation when child drinks fluoridated water
  o Reconstitution of infant formula with fluoridated water

• Methods to decrease risk
  o Parents apply toothpaste to the brush (smear or pea-sized)
  o Toothpaste stored where children cannot easily access it
  o Consider reconstituting formula with bottled water
  o Only prescribe fluoride supplements if no other exposure to fluoride
Dental Fluorosis - Primary Teeth
Dental Fluorosis – Permanent Teeth
## Timing of Tooth Development

### Primary Dentition

<table>
<thead>
<tr>
<th>Tooth Type</th>
<th>Calcification begins at</th>
<th>Formation complete at</th>
<th>Eruption Maxillary</th>
<th>Eruption Mandibular</th>
<th>Exfoliation Maxillary</th>
<th>Exfoliation Mandibular</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central incisors</td>
<td>4th fetal mo</td>
<td>18-24 mo</td>
<td>6-10 mo</td>
<td>5-8 mo</td>
<td>7-8 y</td>
<td>6-7 y</td>
</tr>
<tr>
<td>Lateral incisors</td>
<td>4th fetal mo</td>
<td>18-24 mo</td>
<td>8-12 mo</td>
<td>7-10 mo</td>
<td>8-9 y</td>
<td>7-8 y</td>
</tr>
<tr>
<td>Canines</td>
<td>4th fetal mo</td>
<td>30-39 mo</td>
<td>16-20 mo</td>
<td>16-20 mo</td>
<td>11-12 y</td>
<td>9-11 y</td>
</tr>
<tr>
<td>First molars</td>
<td>4th fetal mo</td>
<td>24-30 mo</td>
<td>11-18 mo</td>
<td>11-18 mo</td>
<td>9-11 y</td>
<td>10-12 y</td>
</tr>
<tr>
<td>Second molars</td>
<td>4th fetal mo</td>
<td>36 mo</td>
<td>20-30 mo</td>
<td>20-30 mo</td>
<td>9-12 y</td>
<td>11-13 y</td>
</tr>
</tbody>
</table>

* In utero

http://www.aapd.org/media/policies_guidelines/rs_dentgrowthanddev.pdf
# Timing of Tooth Development

<table>
<thead>
<tr>
<th>Tooth Type</th>
<th>Calcification begins at</th>
<th>Crown (enamel) complete at</th>
<th>Roots complete at</th>
<th>Eruption* Maxillary</th>
<th>Eruption* Mandibular</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central incisors</td>
<td>3-4 mo</td>
<td>4-5 y</td>
<td>9-10 y</td>
<td>7-8 y (3)</td>
<td>6-7 y (2)</td>
</tr>
<tr>
<td>Lateral incisors</td>
<td>Maxilla: 10-12 mo</td>
<td>4-5 y</td>
<td>11 y</td>
<td>8-9 y (5)</td>
<td>7-8 y (4)</td>
</tr>
<tr>
<td></td>
<td>Mandible: 3-4 mo</td>
<td>4-5 y</td>
<td>10 y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canines</td>
<td>4-5 mo</td>
<td>6-7 y</td>
<td>12-15 y</td>
<td>11-12 y (11)</td>
<td>9-11 y (6)</td>
</tr>
<tr>
<td>First premolars</td>
<td>18-24 mo</td>
<td>5-6 y</td>
<td>12-13 y</td>
<td>10-11 y (7)</td>
<td>10-12 y (8)</td>
</tr>
<tr>
<td>Second premolars</td>
<td>24-30 mo</td>
<td>6-7 y</td>
<td>12-14 y</td>
<td>10-12 y (9)</td>
<td>11-13 y (10)</td>
</tr>
<tr>
<td>First molars</td>
<td>Birth</td>
<td>30-36 mo</td>
<td>9-10 y</td>
<td>5.5-7 y (1)</td>
<td>5.5-7 y (1a)</td>
</tr>
<tr>
<td>Second molars</td>
<td>30-36 mo</td>
<td>7-8 y</td>
<td>14-16 y</td>
<td>12-14 y (12)</td>
<td>12-14 y (12a)</td>
</tr>
<tr>
<td>Third molars</td>
<td>Maxilla: 7-9 y</td>
<td></td>
<td>17-30 y (13)</td>
<td></td>
<td>17-30 y (13a)</td>
</tr>
<tr>
<td></td>
<td>Mandible: 8-10 y</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Acute Toxicity**

- **Toxic effects at 5 mg F/kg body weight**
  - For a 10 kg child, toxicity (nausea & vomiting) can result with ingestion of about 1-2 oz. of toothpaste, or 6-8 oz. of fluoride mouth rinse.

- **Lethal dose may be as low as 15mg F/kg body weight in children**
  - For a 10 kg child, a lethal dose corresponds to < 0.5 oz. of professionally-applied fluoride gel, or about 5 ounces of toothpaste.
Fluoride in Filtered Water

- All fluoride removed by
  - Reverse osmosis
  - Distillation

- Negligible amount of fluoride removed by:
  - Activated charcoal filters
    - Brita® – pitcher-type or faucet mounted
    - Pur® – pitcher-type or faucet mounted
Fluoride in Bottled Water

• Calistoga® mineral water – 0.9 ppm fluoride

• Most bottled waters have minimal to no fluoride

• 20 of 900 brands add fluoride to their water

• Some mineral waters have low levels of fluoride but not usually evident on the label
Resources

- AAP Section on Oral Health
  http://www2.aap.org/commpeds/dochs/oralhealth/index.html

- Tools for providers:
  http://www2.aap.org/commpeds/dochs/oralhealth/PracticeTools.html
Oral Health Practice Tools

Incorporate oral health into your practice with these easy-to-use tools and resources. Learn how to perform an oral health risk assessment, nutrition and oral hygiene counseling, and to apply fluoride varnish when needed as a vital part of the well child exam.

- How Should I Set Up My Practice To Include Oral Health?
  - Oral Health Practice Models
  - Infant Oral Health Model in a Federally Funded Family Health Center Setting (72 KB)
  - Electronic Health Record Template To Include Oral Health (58 MB)

- What Do I Need To Apply Fluoride Varnish in My Office?
  - Where To Get Varnish Materials, Dental Mirrors, and Head Lamps (41 MB)
  - Oral Health Supplies for the Exam Room (25 KB)
  - After Varnish Instructions for Families in English and Other Languages (Spanish, Russian, Cambodian, Somali, Oromo, Vietnamese, Hmong) (651 KB)
Resources

• Oral Health Reimbursement Chart
  o Listing of public and private payers for fluoride varnish for CPT code 99188
• http://www2.aap.org/commpeds/dochs/oralhealth/docs/OralHealthReimbursementChart.xlsx

• FAQ on coding
  o www.aap.org/coding/ICD10
• Campaign for Dental Health

  o [http://ilikemyteeth.org](http://ilikemyteeth.org)

  o Tips and fact sheets regarding fluoride –
    • [http://ilikemyteeth.org/health-professionals/](http://ilikemyteeth.org/health-professionals/)
References