COMMUNITY WATER FLUORIDATION:

70 YEARS OF SUCCESS: IS IT STILL EFFECTIVE & SAFE?

AUGUST 20, 2015
EUSTIS CITY COMMISSION
COMMUNITY WATER FLUORIDATION WORKSHOP
Disclosures-no financial interests

- Speaking as spokesperson of the Fluoridation Action Team of Oral Health Florida
- Speaking as a private practice pediatric dentist
- I do this for the Adults and children that live in pain and suffer every day of their lives because of preventable, contagious, & communicable dental disease
- I don’t get paid jack for doing this
Fluoridation Definition

- Fluoridation is the *precise adjustment* of the fluoride in drinking water to a level that is recommended for optimal reduction of tooth decay.

- This adjustment includes adjustment *upwards* or *downwards*, depending on the natural level of fluoride in the water.

- Natural level of Eustis water is 0.2ppm (mg/L).

- Updated optimal level for community water fluoridation is a uniform 0.7ppm.
Fluoride is Naturally Occurring

- 13th most abundant mineral in the earth’s crust

- Surface water (rivers) -- typically low concentrations, 0.2 mg/L (ppm) or less

- Groundwater (wells) -- higher concentrations, 0.1 mg/L to over 5.0 mg/L

- Ocean water is typically 0.8 to 1.4 mg/L
Required for Decay (Cavities):

- **Diet**
  - sugars and carbohydrates
  - Frequency of intake
  - Form of substrate-sticky vs non-sticky

- **Oral hygiene**

- **Xerostomia (Dry Mouth)**
  - medications
  - salivary flow and composition

- **Bacteria Levels**
  - (especially mutans streptococci)

- **Tooth Anatomy**
Summary of Mechanisms of Action of Fluoride Ion

For the best prevention of cavities:
Both *Systemic* and *Topical* fluoride exposure are important:

1. Fluoride becomes incorporated into developing permanent teeth of children while still under gums—more resistant to cavities (*systemic effect*)

2. Frequent exposure to low concentrations of fluoride: saliva, release from plaque—reducing acid attack leading to cavities (*topical effect via systemic CWF*)

3. Water fluoridation and dentifrices (toothpaste), fluoride mouthrinses, and professionally applied varnishes (*topical and systemic* effects from CWF and fluoride containing products)
Frederick S. McKay

1901 – established practice in Colorado Springs, CO

- Curious mind and good observational skills
- “Colorado Brown Stain”
  - Stain was difficult to polish off – must be caused during the period of enamel formation – environmental agent
  - Only life-long residents (or those who had moved there as infants) had stain

- 1908 – began to investigate extent of condition in surrounding area

**Key Observation:** very few cavities in this population
Other Important Events

• 1930 - H. V. Churchill used a newly available method of spectrographic analysis that identified high concentrations of fluoride (13.7ppm) in the water of a community in Arkansas with high rates of mottled enamel.

• 1931 – McKay contacted Churchill and sent him water samples. Fluoride was discovered in each sample that McKay sent for analysis (2.0ppm to 12.0 ppm).

• It was now known what substance in the water was causing the staining of teeth - natural high levels of fluoride in water.
H. Trendley Dean

- 1931 - First dentist appointed to the National Institute of Health

- **Primary responsibility** - investigate the association between fluoride and mottled enamel

- Mid 1930s – Dean began to use the term fluorosis in place of mottled enamel

- Determined that fluorosis caused by water with 1.0 ppm or less was of “no public health significance”
What is dental fluorosis?

- Dental fluorosis is a change in the appearance of the tooth's enamel.
- Very mild and mild forms of dental fluorosis (the most common forms)—teeth have scattered white flecks, occasional white spots, frosty edges, or fine, lacy chalk-like lines. These changes are barely noticeable and difficult to see except by a dental health care professional.
- Moderate and severe forms of dental fluorosis—teeth have larger white spots and, in the rare, severe form, rough, pitted surfaces.
- Dental fluorosis only occurs when younger children consume too much fluoride when teeth are developing under the gums.
Dean’s Investigations

• Developed the Community Fluorosis Index (Dean’s Fluorosis Index)
  − Normal
  − Questionable
  − Very Mild
  − Mild
  − Moderate
  − Severe

→ Led to the landmark study of introduction of fluoridation in 1945
Community Water Fluoridation Begins

- Grand Rapids, Michigan was the first city to adjust fluoride concentration in public drinking water (1945). Cavity rates dropped dramatically.

- Gainesville 1st city in Fluorida to fluoridate-Go Gators-1949

- The rest is History

- 2015 marked the 70th anniversary of community water fluoridation
An Ounce of Prevention: Community Water Fluoridation

After 70 years of CWF in the United States, the FACTS:

1. **Safe**—NO adverse health effects in anyone
2. **Effective**—Adults & Children benefit: 25% reductions in cavities
3. **Cost Savings**—Saves millions of dollars in treatment costs and eliminates pain and suffering
4. **CDC**: One of 10 great Public Health Achievements of the 20th century
5. Helps Americans keep their **teeth longer into adulthood** more than ever before
6. **>210 million** U.S. residents served by it daily (2012)
Previous levels were a range of fluoride in water from 0.7-1.2 ppm (mg/L).

This range was based on water intakes of residents in the U.S. and was related to temperature gradients.
Total Water Intake

- Since the early 1960’s when previous range was set, climate controlled environments have become the norm.

- Total Water Intake:
  - Water intake was the same from coast to coast and north to south
  - A Federal panel was convened to evaluate this data in 2010
  - Decision was reached that for the maximum level of cavity reductions with the minimal level of dental fluorosis, a new single level of fluoride was established for the entire country
  - HHS proposed the level to be at the lower level of the range: 0.7ppm
In September 2010, the Department of Health and Human Services convened a panel of scientists from across the U.S. government to review new information related to fluoride intake and to consider a new recommendation for community water fluoridation. The federal panel reviewed the best available information, including changes in the occurrence and severity of tooth decay and of dental fluorosis in U.S. children and adults. The panel also studied the U.S. Environmental Protection Agency's (EPA) scientific assessments of the major sources of fluoride intake and risk of severe dental fluorosis among children. Severe dental fluorosis is rare in the United States. Based on this review, the federal panel proposed changing the recommended level for community water systems to 0.7 milligrams per liter (the low end of the prior recommended range of 0.7 to 1.2 milligrams per liter). The proposed change was published in the Federal Register. Public comment on the proposed new level was sought—and considered carefully by the Panel—before finalizing the new recommendation. In addition, the proposed recommendation was submitted to a Peer Review Process, a step required by the federal government for influential scientific information.
Final Recommendation Release April 27, 2015

All community water systems that fluoridate their water are recommended to fluoridate at 0.7ppm
Why Do Cavities Matter?

• Infection
• Extreme pain
• Difficulty in chewing
• Poor weight gain
• Difficulty concentrating
• Missed school hours
• Predictor of cavities in later life
• Costly treatment

• **LIFE THREATENING**

• DEATH

Deamonte Driver, 12, died February 25, 2007, after an infection from a molar spread to his brain
CAVITIES: Disproportionately Distributed

- Nearly 80% of cavities occur in 20% of the population
- The poor bear a disproportionate burden of cavities
Is Water Fluoridation Still Necessary?

YES!

Systematic Reviews:

✓ Effect of Starting Community Water Fluoridation: 29.1% cavity reduction

✓ Effect from Stopping CWF: 17.9% increase in cavities
THE SCIENCE IS CRYSTAL CLEAR

No Debate!!
Fluoridation is Safe, Effective, and Provides Huge Cost Savings & Reduces Human Pain and Suffering
“Everyone is entitled to his own opinions……

………..but not his own facts”
Debates on the science of any topic takes place in expert panels that have been set up to critically evaluate the literature, never in public forums.

1. Community Preventive Services Taskforce: Systematic Reviews
   - Blue Ribbon Panel Established by Congress
   - Purpose is to scientifically evaluate the literature
   - Provide recommendations to communities

2. National Research Council’s: Systematic Reviews
   “Scientific Review of EPA Standards on Fluoride in Drinking Water, 2006”
   - 3 ½ years of debate
   - Recommendations and findings
Recommendations Reaffirmed 2013:

1. Community Water Fluoridation is RECOMMENDED based on STRONG EVIDENCE of effectiveness in reducing cavities across populations.

2. Evidence shows the prevalence of cavities is substantially lower in communities with community water fluoridation (CWF).

3. There is NO EVIDENCE that CWF results in severe fluorosis.
Report issued in March 2006
Focused on naturally occurring high levels of fluoride in drinking water. (~200,000 people, ~$4 million dollars spent on study)

**Reviewed studies:**

- Effects of Fluoride on Teeth
- Musculoskeletal Effects - NO!
- Reproductive and Developmental Effects - NO!
- Neurotoxicity and Neurobehavioral Effects - NO!
- Effects on the Endocrine System - NO!
- Effects on the Gastrointestinal, Renal, Hepatic, and Immune Systems - NO!
- Genotoxicity and Carcinogenicity - NO!

**States with high levels of fluoride naturally occurring:**

- S. Carolina 5.9 mg/L
- Virginia 6.3 mg/L
- Texas 8.8 mg/L
- Colorado 11.2 mg/L
- Oklahoma 12.0 mg/L
- New Mexico 13.0 mg/L
- Idaho 15.9 mg/L
Report issued in March 2006:

1. **No Health Effects** from fluoride in water at 2mg/L (2ppm)

2. **Severe fluorosis is virtually zero** at 2mg/L fluoride in water

**IMPORTANT NOTE:**
Community water fluoridation = 0.7ppm (mg/L)
- 1/3rd level at which severe fluorosis is virtually zero
1. The Weight of Science

No widely respected medical and health organizations opposes fluoridation.

2. No adverse health effects from drinking fluoridated water (CWF)
Community Preventive Services Task Force finds no evidence of severe fluorosis with CWF.

2006 NRC Review finds no evidence of severe fluorosis below 2mg/L (ppm) fluoride in water. CWF 1/3rd this level = 0.7ppm.

Accurate Photos of Enamel Fluorosis

A Public Health Achievement

“Fluoridation is the single most important commitment a community can make to the oral health of its children and to future generations.”

Dr. C. Everett Koop

“Fluoridation is the single most effective public health measure to prevent tooth decay and improve oral health over a lifetime, for both children and adults.”

David Satcher, MD, PhD

“Community water fluoridation is one of the most practical, cost-effective, equitable, and safe measures communities can take to prevent tooth decay and improve oral health. [E]ach generation born since the implementation of water fluoridation has enjoyed better dental health than the preceding generation.”

Dr. Vivek H. Murthy, MD, MPH
Surgeon General (2014-current)
WHICH WOULD BE YOUR CHOICE???

Tooth Decay or Mild Dental Fluorosis
Water fluoridation:

- **No adverse health effects from drinking fluoridated water**

- Is Safe, Effective, and the most Cost Efficient means to reach everyone with the cavity fighting benefits of CWF

- benefits all members of the community, regardless of age, race, SES, access to dental care

- offers a great return on its investment: For every $1 invested in fluoridation, $43 in dental treatment costs/person/year are avoided

- is *recommended* by the Task Force on Community Preventive Services and all major health organizations; WHO, CDC, AAP, ADA, AMA……
Claims by Opponents-all false

- Not needed, doesn’t work, small effect, there are alternatives
- ADA states don’t use in infant formula
- Lowers IQ in children
- Communist Plot
- Hitler used it in Jewish Concentration camps
- Infringement on personal rights
- Forced Medication
- Increases lead uptake
- Cancer
- Down Syndrome
- Allergies, AIDS, Alzheimer’s disease
- Breast milk fluoride level-”Mother Nature knows best”
- Effects on the renal, gastrointestinal, and immune systems, reproductive problems
- Fluorosis is sign of toxic effects on body
- Government Conspiracy-dentists taught to believe it works
If you throw it at a wall often enough, some of it’s going to stick
Claim: *Fluoride is an additive, equivalent to forcing people to take medicine*

**FACTS:**

- U.S. courts have *rejected* the idea that fluoride is a medication and should not be allowed in water supply.

- **Fluoridation**: the adjustment of *natural* (background) water fluoride levels to bring to optimum. *Most of Florida’s groundwater contains about 0.2ppm fluoride*. It needs to be adjusted upwards just a smidge to 0.7 ppm for maximum benefit in reducing cavities.

- **Fortification** is a common practice - Folic acid, Vitamin D, Iodine etc.
Claim: **Fluoridation chemicals are different from naturally occurring fluoride**

CDC:

**Fluoride Additives Are Not Different From Natural Fluoride**

Some consumers have questioned whether fluoride from natural groundwater sources, such as calcium fluoride, is better than fluorides added "artificially," such as FSA or sodium fluoride. Two recent scientific studies, listed below, demonstrate that the same fluoride ion is present in naturally occurring fluoride or in fluoride drinking water additives and that no intermediates or other products were observed at pH levels as low as 3.5. In addition, the metabolism of fluoride does not differ depending on the chemical compound used or whether the fluoride is present naturally or added to the water supply.


The three additives approved for use by the American Water Works Association:

1. **Fluorosilicic acid**: a water-based solution used by most water systems in the United States. Fluorosilicic acid is also referred to as hydrofluorosilicate, FSA, or HFS.

2. **Sodium fluorosilicate**: a dry additive, dissolved into a solution before being added to water.

3. **Sodium fluoride**: a dry additive, typically used in small water systems, dissolved into a solution before being added to water.
Claim: “FSA (hydrofluorosilicic acid) is not acceptable because it adds dangerous impurities like arsenic and lead to water supply.”

FACT:

1. To ensure the public's safety, all additives used at a water treatment facility must meet strict quality standards.

2. American Water Works Association (AWWA) and the NSF/ANSI (National Sanitation Foundation/American National Standards Institute) measure levels of impurities.

3. The average concentration of arsenic and lead from all samples of water fluoridated with FSA, tested by NSF International from 2000 to 2011 was less than 0.1 ppb (parts per billion). EPA allowable is 10.0 ppb.
Claim: “no double-blind studies ever done”

Fact:

- **Population-based studies** are used routinely to assess observational findings.

- No Double-blind studies have ever been done on:
  - Tobacco
  - Alcohol
  - STD’s

  Population-based studies were used to see their effects on our bodies.

- Population-based studies are used to evaluate fluoride’s safety and effectiveness.

- No Double-blind studies needed to be conducted to connect the dots between tobacco and lung disease/cancer, Alcohol and its health effects, or the damages from STD’s.
Claim: “The ADA warns parents not to add fluoridated water to infant formula because of its harmful effects”

FACT:
This has NEVER been accurate!!!

ADA recommendations:
- **Continued use** of liquid or powdered concentrate infant formulas reconstituted with optimally fluoridated drinking water while being cognizant of the potential risk for *mild* enamel fluorosis

- Use ready-to-feed formula or liquid or powdered concentrate formula reconstituted with water that is either fluoride-free or has low concentrations of fluoride when the potential risk for *mild* enamel fluorosis may be a concern for parents
Claim: “Just look at Warning Label on back of a tube of toothpaste! Poison!!”

“To this day, according to the American Association of Poison Control Centers, there have not been any deaths or serious adverse reactions from ingestion of fluoride toothpastes”

- Clifford W. Whall, Jr., PhD
  Director of Acceptance Program
  ADA Council on Scientific Affairs
  April 2, 2012, email to Dr. Johnny Johnson

• Responsible Parenting
• Same labeling on vitamins, Tylenol-required by FDA
FACT: No one has ever died responsible parenting!!

- It would take a 20kg child (~4 year old) ingesting 2 full tubes of Adult sized toothpaste at one setting to reach a lethal dose of fluoride.

- The sudsing agent and abrasive components of toothpaste would cause anyone ingesting excess toothpaste to throw up.
**Claim:** Fluoridation causes a decrease in IQ

**FACT:** Low quality studies of IQ effect from high fluoride communities in China

“In our appraisals we found that the study design and methods used by many of the researchers had serious limitations. The lack of a thorough consideration of confounding as a source of bias means that, from these studies alone, it is uncertain how far fluoride is responsible for any impairment in intellectual development seen.”

Bazian. “Independent critical appraisal of selected studies reporting an association between fluoride in drinking water and IQ. A report for South Central Strategic Health Authority. February 2009.”

In other words, **NO IQ changes** have been shown to be attributable to naturally occurring fluoride levels in water based on their review and reviews of other credible scientific organizations internationally. These claims are made based on the Harvard Meta-analysis by Choi & Grandjean.
Harvard’s researchers conducted Meta-analysis of Chinese studies:

Researchers distanced themselves from anti-fluoridationists who were using their analysis to draw their own statements of harm from CWF

“Harvard University scientists say that Wichita voters shouldn’t depend on a research study they compiled to decide whether to put fluoride in the city’s drinking water to fight tooth decay.

While the studies the Harvard team reviewed did indicate that very high levels of fluoride could be linked to lower IQs among schoolchildren, the data is not particularly applicable here because it came from foreign sources where fluoride levels are multiple times higher than they are in American tap water.”

Wichita Eagle: Anna Choi and Philippe Grandjean in email to Wichita Eagle
Claim: "Fluoridated water contains 250 x more fluoride than mother's milk."

FACTS:

- There are no known adverse health effects for infants. Milder form of dental fluorosis is the only risk.

- Vitamin D is added to milk because mother's milk lacks sufficient amounts. The National Academy of Sciences and the American Academy of Pediatrics recommends vitamin D per day beginning during the first 2 months of life.
Conclusion: Chronic ingestion of fluoride at levels up to 230 times more than that experienced by humans whose main source of fluoride is fluoridated water had no significant effect on appetitive-based learning.
Claim: “We should discontinue fluoridation because 41% of children in the US have dental fluorosis.”

FACTS:
97% of adolescents ages 12-15 have fluorosis of the very mild to mild types. A study by Lido and Kumar suggested that molars with fluorosis were more resistant to cavities than those without fluorosis.
Claim: Most countries in Western Europe don’t fluoridate, so why do we?

- The U.K., Spain, and Ireland have fluoridated water
- In some parts of western Europe, large number of water systems make community water fluoridation (CWF) logistically challenging, so they practice salt or milk fluoridation instead
- Nearly the same number of people are using salt and milk fluoridation as CWF
- 405 million people in 60 countries drink fluoridated water
Claim: “The National Kidney Foundation withdrew its support of water fluoridation”

**FACT:** "The NKF has no position on fluoridation of water."

- Dietary advice for patients with CKD should primarily focus on established recommendations for sodium, potassium, calcium, phosphorus, energy/calorie, protein, fat, and carbohydrate intake. Fluoride intake is a secondary concern.

- There is no consistent evidence that the retention of fluoride in people with these stages of CKD (stages 4 & 5) who consume optimally fluoridated drinking water results in any negative health consequences.

http://www.kidney.org/
FACT: Studies show **fluoride works via both topical and systemic effects**. There is a pre-eruptive cavity preventive effect and continuous exposure to small amounts of fluoride is the best for remineralization of tooth enamel (benefits both adults and children).

“The findings indicated that **pre-eruption** exposure was required for a caries-preventive effect and that **exposure after eruption alone** did not lower caries levels significantly. **However, the maximum caries-preventive effects of fluoridated water were achieved by high pre- and posteruption exposure.**”

Claim: Fluoride is an additive, equivalent to forcing people to take medicine

FACTS:

- U.S. courts have rejected the idea that fluoride is a medication and should not be allowed in water supply.

- **Fluoridation**: the adjustment of natural (background) water fluoride levels to bring to optimum. Most water in Florida contains approximately 0.2ppm fluoride. It needs to be adjusted upwards just a smidge to 0.7 ppm for maximum benefit in reducing cavities.

- **Fortification** is a common practice - Folic acid, Vitamin D, Iodine etc.
There is no need to control water intake. Fluoride from dental products, primarily swallowed toothpaste by young children, needs to be used appropriately as they are a major contributor to fluorosis, even in areas without fluoridation.

There is a history of over 70 years of safety record of fluoridation in the United States.

NRC Report showed that severe fluorosis near zero below 2mg/L (2ppm)

EPA’s analysis provides that the proposed recommendation of 0.7 mg/L of F^- will protect against any potential adverse health effects.
Claim: There are better ways to deliver fluoride

**FACT:** There are no better, more effective means to deliver fluoride to a population than CWF. It is considered the “Gold Standard” of fluoride delivery

1. CWF benefits all, regardless of age SES, race, education, dental insurance coverage and access to dental care

2. Even with fluoridated toothpaste, areas with CWF show lower rates of tooth decay of 25% or more

3. The National Preventive Dentistry Demonstration Program found community water fluoridation (CWF) to be the most effective in terms of cost and outcomes

4. Strong support from economic analysis
## Alternatives have Limitations: Impact of a Magic Pill

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<tr>
<th>Issues</th>
<th>Factors</th>
<th>Estimate (%)</th>
<th>Impact (%)</th>
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<tbody>
<tr>
<td>Efficacy</td>
<td>Pill reduces cavities in permanent dentition by 50%</td>
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<td>Adoption</td>
<td>90% of clinics and physicians write prescriptions</td>
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<td>45</td>
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<td>Reach</td>
<td>90% of parents buy prescriptions</td>
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<td>Implementation</td>
<td>90% of children take the pill every day</td>
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<td>Maintenance</td>
<td>80% of children engage in this behavior on a long term basis</td>
<td>80</td>
<td>29</td>
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Source: Adapted from Lawrence Green, CDC Workshop, October 2007.
Claim: “Communities are putting an end to fluoridation.”

FACTS:

- The percent of the U.S. population on community water systems increased from 69.2% in 2006 to 74.6% in 2012 (5.4%).

- In 2012, 210.7 million people in the U.S. population on community water systems had access to fluoridated water.

- In Florida, over 13.3 million (~77%) people receive optimally fluoridated water.
Water fluoridation:

- Is Safe, Effective, and the most Cost Saving means to reach everyone with the cavity fighting benefits of CWF

- benefits all members of the community, regardless of age, race, SES, access to dental care

- offers a great return on its investment: For every $1 invested in fluoridation, $43 in dental treatment costs/person/year are avoided

- is *recommended* by the Task Force on Community Preventive Services and all major health organizations; CDC, AAP, ADA, AMA……

- “Fluoridation is the single most important commitment a community can make to the oral health of its children and to future generations.”
  
  Surgeon General C. Everett Koop
No widely respected medical and health organizations oppose fluoridation.
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Community Water Fluoridation

Normal

Questionable

Very mild

Mild

Moderate

Severe

Accurate Photos of Enamel Fluorosis

Community Water Fluoridation

QUESTIONS?

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