COMMUNITY WATER FLUORIDATION: MARIN MUNICIPAL WATER DISTRICT

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Enamel Fluorosis and Tooth Decay

Photographs of enamel fluorosis from Forum on Water Fluoridation in Ireland, 2002

Decay is more common, unesthetic and serious

Tooth Decay and abscesses
Effectiveness of fluoridation in preventing caries in adults

- Adults, coronal caries
- Only lifelong residents of control or fluoridated-water communities
- 7 studies
- 5409 participants

- Prevented fraction of 34.6%
- (95% CI: 12.6%-51.0%)

Fluoridation prevents tooth decay in children and adults

Children
30% to 60% of dental caries in the primary dentition,
20% to 40% in the mixed dentition, and
15% to 35% in the permanent dentition

Adults ages 20 to 44 years
20% to 30% for coronal caries and
20% to 40% for root caries.


- An annual incremental benefit of fluoridation of 0.19 tooth surfaces (range 0.04-0.34)
- This equates to 1.9 tooth surfaces every decade, or 9.5 tooth surfaces over 50 years.

Fluoridation prevents tooth decay in adults – half a tooth surface annually

- Studies published during or after 1980
- Fluoridation prevents 27% of adult caries
- Any fluoride (self-applied and professionally-applied or from fluoridated water) annually averted
- 0.29 carious coronal surfaces and
- 0.22 carious root surfaces in adults

NIDCR: Fluoridation protects teeth in two ways

- When delivered through the water supply to children during the tooth forming years.
- Through direct contact with teeth throughout life.

http://www.nidcr.nih.gov/DataStatistics/FindDataByTopic/WaterFluoridation/
How fluoride works to prevent tooth decay

**Fluoride’s pre-and post-eruptive effect on subsequent caries experience**

<table>
<thead>
<tr>
<th>Depends on Surface</th>
<th>Dentinal Caries Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-eruption</td>
</tr>
<tr>
<td>Pit &amp; Fissure</td>
<td>66%</td>
</tr>
<tr>
<td>Approximal</td>
<td>50%</td>
</tr>
<tr>
<td>Smooth</td>
<td>25%</td>
</tr>
</tbody>
</table>

Longitudinal Dutch Tiel (fluoridated) – Culemborg (non-fluoridated) study of children from ages 7 to 18

Prevalence of SEVERE enamel fluorosis and water fluoride concentration

No severe enamel fluorosis below 2 mg/L (ppm) fluoride in water

Guideline Value W.H.O., Canada, EU
Maximum 1.5 mg/L

EPA SMCL – 2 mg/L

Fluoridation 0.7 – 1.2 mg/L

US EPA MCLG 4 mg/L
Enamel fluorosis prevalence by severity – USA 1999-2004

- Three-quarters have no definitive visible signs of enamel fluorosis.
- Less than 1% have severe fluorosis
Fluoride's benefits and risks

- Like any substance, including pure water, the dose is what distinguishes benefits from risks.
- Drinking excessive amounts of pure water in a short period of time can be lethal.
- Water fluoridation has been clearly shown to be a benefit in reducing the prevalence and severity of tooth decay by an overwhelming body of evidence.
- The risk of water fluoridation is a 10-15% increase in very mild or mild dental fluorosis, a condition that is generally not considered to be a cosmetic problem and has no health implications.
- That level of fluorosis has been associated with reduced tooth decay.
Fluoridation and arthritis

- No association between water fluoridation and arthritis has been established
- There is speculation because some studies have shown an association between very high fluoride intake and symptoms/signs of arthritis
- Typical risk factors for arthritis are family history, age, obesity, and previous joint injury
Why would people think that fluoridation and arthritis are associated?

- Studies from China
- Reported by Fluoride Action Network
- Not reported by the National Institutes of Health
- Some studies have found an association between arthritis and very high fluoride intake
- The next slide shows a graph from Fluoride Action Network from a Chinese study
Fluorosis afflicted regions of Gaomi City, China with high fluoride concentration in drinking water

Prevalence of arthritis symptoms Increases beyond 1.69 ppm F/water

- [http://www.fluoridealert.org/issues/health/arthritis/](http://www.fluoridealert.org/issues/health/arthritis/)

This study shows low levels of joint pain or rigidity up to 1 ppm F
Fluoridation and arthritis

- The claim that fluoridation initiates arthritis and osteoarthritis has no significant scientific support.
- Recent reviews (Australia 1999), (Medical Research Council, England 2002) and the World Health Organization (2002) dismissed such claims.
Fluoridation and hypothyroidism

- Fluoride was used at one time in treating thyroid disorders without much success.
- Publications from India have indicated fluoride is an antagonist to iodide and has an effect on the thyroid.
- However, the concerns there are very different than in the USA due to endemic severe dental fluorosis that is a significant problem in some parts of India from very high naturally-occurring fluoride in drinking water.
Endocrine effects of fluoride
including thyroid effects

- None reached the level considered to be signs of adverse effects at the 4mg/L level
- March 22, 2006, News Conference
- Chairman John Doull, M.D., Ph.D., Professor Emeritus of Pharmacology and Toxicology, University of Kansas Medical Center, Kansas City
Fluoridation and osteosarcoma

- A Harvard graduate student’s thesis suggested that *estimated* fluoride intake was associated with osteosarcoma in boys.

- A subsequent Harvard study that measured *actual* bone accumulation of fluoride found no association with osteosarcoma.

Fluoride is not a carcinogen

- No Authoritative Body Has Concluded that Fluoride is a Carcinogen
  - U.S. Environmental Protection Agency
  - U.S. Food and Drug Administration
  - U.S. National Toxicology Program
  - U.S. National Institute for Occupational Safety and Health
  - International Agency for Research on Cancer
  - European Scientific Committee on Health and Environmental Risks (SCHER)
Ruling by the Carcinogen Identification Committee of the California Office of Environmental Health Hazard Assessment

- In October 2011, the California Office of Environmental Health Hazard Assessment (OEHHA) through its Carcinogen Identification Committee (CIC) determined that fluoride does not cause cancer. The review was part of California's Proposition 65 listing process.

- There is a statement on the unanimous decision not to list fluoride as a carcinogen on the OEHHA website:
  - [http://oehha.ca.gov/prop65/public_meetings/cic101211synop.html](http://oehha.ca.gov/prop65/public_meetings/cic101211synop.html)

- California Panel votes against adding fluoride to carcinogen list

- Apologies for the advertisement before the video

5/17/2013
Does ingestion of water fluoridated at recommended levels have any effect on intelligence (IQ) in children or neurological impact?

**Answer.**

- The best available science-based evidence does NOT establish a causal relationship between consumption of water fluoridated at recommended levels and lowered intelligence (IQ) in children, behavioral disorders or central nervous system disorders.
Does ingestion of water fluoridated at recommended levels have any effect on intelligence (IQ) in children or neurological impact?

Answer (continued).

- A systematic review published in 2012, from Harvard University, analyzed 27 epidemiological studies that were conducted in China and Iran. The stated purpose of the Harvard review was to research the possibility that fluoride in drinking water acts as a neurotoxicant during child development.

- Seventeen of the studies included in the Harvard study were reviewed previously by the Bazian Group and were criticized for their many limitations.

- Not all of the studies included in the Harvard review identified the level of fluoride in the community drinking water. In one study that did identify the fluoride level in the community drinking water, the level was 11.5 mg/L which is more than 10 times higher than the recommended level of fluoride in drinking water in the United States.
Does ingestion of water fluoridated at recommended levels have any effect on intelligence (IQ) in children or neurological impact?

Answer (continued).

- The authors stated that the studies had deficiencies and did not take into account other factors that can affect IQ such as poverty, exposure to heavy metal pollution (arsenic and lead) and dietary deficiencies.

- Of note is that the Harvard authors stated their review does not address the safety of fluoride levels typically found in the U.S.
Fluoridation In California

- Increased from 1990 to now
- From 16% in 1990 to 62% in 2010
- Los Angeles (1999)
- Sacramento (2000)
- San Francisco PUC extended (2003)
- San Diego (2011)
- Some small communities have ceased
California Population and Public Water Systems Receiving Fluoridated Water

<table>
<thead>
<tr>
<th>Type</th>
<th>January, 2006</th>
<th>September, 2007</th>
<th>December, 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PWS Count</td>
<td>Population (Million)</td>
<td>PWS Count</td>
</tr>
<tr>
<td>Adjusted</td>
<td>46</td>
<td>8.46</td>
<td>50</td>
</tr>
<tr>
<td>Consecutive</td>
<td>29</td>
<td>1.44</td>
<td>35</td>
</tr>
<tr>
<td>Variable</td>
<td>11</td>
<td>1.12</td>
<td>10</td>
</tr>
<tr>
<td>Natural</td>
<td>3</td>
<td>0.02</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>89</td>
<td>11.04</td>
<td>101</td>
</tr>
</tbody>
</table>

Note: 1/1/07 State population was 37.7 million. PWSs served approximately 36.6 million.

Source: Dave Lancaster, Sacramento District Engineer, CDPH. April, 2008
Growth of Fluoridation in California

Percentage of Californians on Public Water Supplies Receiving Fluoridated Water

- **1990**: 16%
- **1995**: 17%
- **2000**: 35%
- **2005**: 45%
- **2010**: 62%

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Fluoridation and Informed Consent

- Case law: Espronceda v. City of San Antonio
- 2003 Tex. App. LEXIS 4334
- "The Esproncedas claim that the citizens who voted against ordinance 92255 are being medicated by the City without their consent, as are those who receive water from the City's water supply but were unable to vote against the ordinance. However, as the Florida Fourth District Court of Appeals noted in a similar challenge to fluoridation of a municipality's water supply:"

- "Importantly, the city proposes to fluoridate the water before it enters each household in the city; it is not seeking to introduce the mineral directly into [plaintiff's] bloodstream. Therefore, the city's fluoridation of its water stops with [plaintiff's] water faucet. The city is not compelling him to drink it. He is free to filter it, boil it, distill it, mix it with purifying spirits, or purchase bottled water. His freedom to choose not to ingest fluoride remains intact."

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Community Water Fluoridation

10 Reasons to Fluoridate:

1. Single most effective public health measure to prevent tooth decay
2. Simulates the natural optimal level of fluoride
3. Similar to fortifying other foods and beverages
4. Overwhelming evidence
5. Protects all ages against cavities
6. Safe for people and the environment
7. Saves money
8. Recognized by more than 100 organizations
9. 73.9% of people on US public water systems on fluoridated water
10. Endorsed by the ADA, AMA, AWWA, WHO

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Thank you
Questions?

- Email: howard.pollick@ucsf.edu