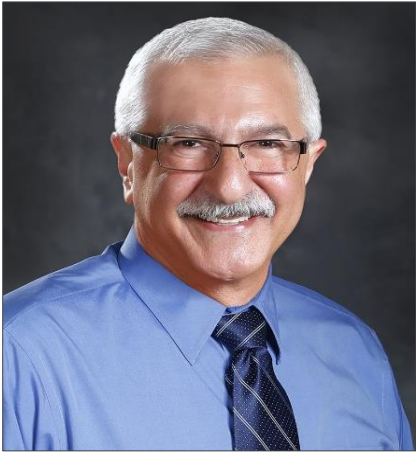


Replicating Mother Nature

Water Operators make the difference in the oral health of Adults and Children in New Hampshire

*Water Fluoridation:
Separating Science-based facts from personal opinion*

Disclosure and “alternative work”



Johnny Johnson, MS, DMD, is president of the American Fluoridation Society. He has no financial or other conflicts to disclose related to the information cited in this presentation.



1. How did we discover fluoride's benefits?

Fluoride: A naturally occurring mineral



- 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** is typically 0.8 to 1.4 mg/L

The early years of fluoride research

Dr. Frederick S. McKay

- **1901:** He established his dental practice in Colorado Springs, CO
- “Colorado Brown Stain” — Only life-long residents (or those who had moved there as infants) had it
- **1908** – He began to investigate the extent of fluorosis in surrounding areas



Key Observation: *Very few cavities in this population*

Intensive research begins

Objective: Explore the link between fluoride & cavity reduction

1.0 mg/L
fluoride led to
optimal cavity
reductions
without brown
staining

H. Trendley Dean

- 1931 begins to study epid. of F-
 - Improves technology of assay
 - Creates and index
- 1933 - Compares "High" and "Low" F- communities.
- 1939 - Compares "high" and "low" F- communities.
- 1941- Launches field investigation – "21 Cities" study.

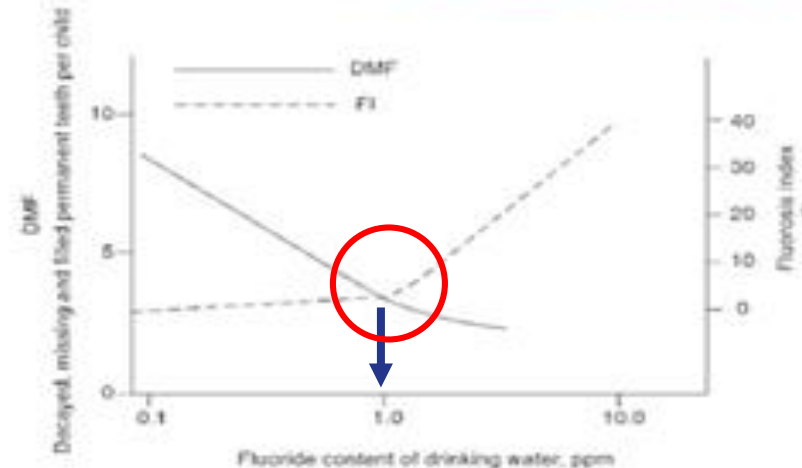


FIGURE 5.3 Relationship between the fluoride content of drinking water, caries occurrence, and dental fluorosis. (Source: H. C. Hodge, The concentration of fluorides in drinking water to give the point of minimum caries with maximum safety. *J. Am. Dent. Assoc.*, 40, 436-439, 1950. Copyright © 1950 American Dental Association. All rights reserved. Adapted 2008 with permission of the American Dental Association.)

Studies to replicate Mother Nature

- 4 pairs of cities in the U.S. and Canada were identified to study the effect of water fluoridation
 - *4 cities adjusted to 1.0 mg/L of F, and 4 remained non-fluoridated*
- Grand Rapids, Mich. was the first city to adjust fluoride levels in public drinking water (1945)
 - *Muskegon, MI was the control city*
- Cavity rates dropped dramatically: **60-70%**



How fluoride works

Topical Effect

- From the outside of the tooth
- Saliva, fluoridated toothpaste and other topical products

Systemic Effect

- From the *inside* and *outside* of the tooth
- Saliva bathes the teeth enamel 24/7 every day*



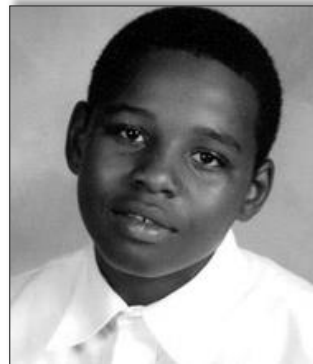
Adults also benefit, rather than only children (as was once assumed)

2. What are the health benefits of Fluoridation?

Why oral health matters

Dental cavities are the **most common chronic disease** for children and teens. It's significantly more common than *asthma, obesity, and diabetes*. **Infectious and Transmissible**

- Severe pain (toothaches)
- Difficulty in chewing
- Poor weight gain
- Difficulty concentrating
- Predictor of cavities later in life
- Costly to treat
- Deaths



Cavities are unevenly distributed



- Low-income kids are more than twice as likely to experience tooth decay.
- The disadvantaged bear a disproportionate burden of cavities
- **In New Hampshire, >106,000 people are living in poverty (8.1%)**

Avoiding the need for hospital treatment

- The average cost of treating early childhood decay in hospital operating rooms in Colorado ranged from **\$10,000 to \$15,000** per child
- A study in Israel study estimated that water fluoridation may be preventing approximately **300 hospitalizations** each year from dental infections

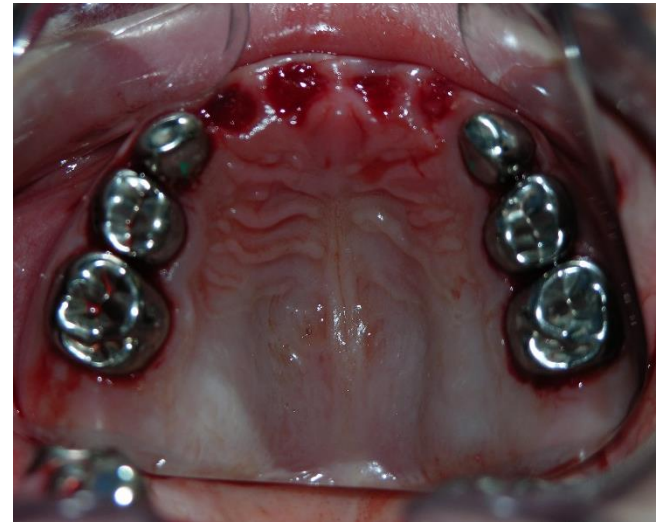


The impact that you make on your community

“Water operators in the U.S. do more to reduce dental decay than all the dentists in the country”

Kip Duchon, National Fluoridation Engineer, CDC, retired

Reducing OR/GA full-mouth restorations by 2/3



Everyone feels the financial impact

Treating a preventable disease financially punishes families and taxpayers

- CWF (or the lack of it) impacts the health and wealth of families and the community
- Average cost of a filling = **\$204**
- The lifetime cost of a single decayed molar can reach as high as **\$6,105**
- CWF saved Texas' Medicaid program **\$24 per child, per year** in dental treatment costs



A form of prevention that reaches everyone

Impact of CWF: 25% cavity reductions for all, regardless of age, income level, race, ethnicity, education level, or access to dental care




A window to overall health



The Mayo Clinic calls oral health a “window to your overall health”

A (big) ounce of prevention

- The CDC called water fluoridation one of “*10 great public health achievements of the 20th century.*” 
- Fluoridation reduces tooth decay by **25%** over a lifetime — protection **beyond** what is offered by **fluoride toothpaste** and other methods.
- Over 201 million U.S. residents have access to fluoridated water.

A strong consensus of support

- **American Water Works Association**
- **Department of Defense**
- American Academy of Family Physicians
- **American Academy of Pediatrics**
- American Academy of Pediatric Dentistry
- **American Dental Association**
- American Dental Hygienists' Association
- **American Medical Association**
- American Osteopathic Association
- American Nurses Association
- American Public Health Association
- Assoc. of Maternal & Child Health Programs
- **CDC**



- National Academy of Medicine (*formerly known as the Institute of Medicine*)
- **Mayo Clinic**
- Every US Surgeon General since fluoridation began
- **World Health Organization**

Most FSA comes from Florida



(Look closely at the bottom of the picture. This is actually a citrus processing plant)

Most FSA comes from Florida



Mosaic phosphate plant



Scrubber

3. What happens when Fluoridation is stopped?

What happens when CWF ends



Major cavity increases after cessation:

- **Juneau, Alaska** – Dental disease among preschool-age kids increased, requiring an average of 1 additional dental procedure *per child, per year*
- **Calgary (Canada)** – Cavity rates among children skyrocketed 146% in 3 years
- **Windsor (Canada)** – Cavity rates & emergent dental needs increased 51% in a 5-year period

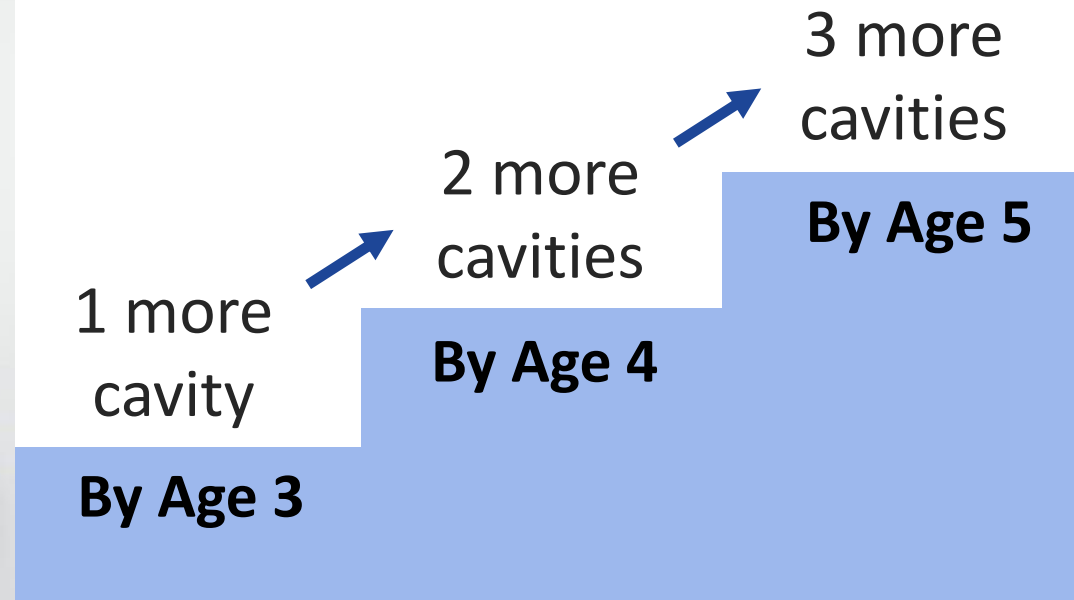
What happens when CWF ends

- Alaska's capital city **Juneau** stopped adding fluoride to its drinking water in 2007.
- Researchers carried out a study to examine Medicaid dental claims to explore the impact of cessation.



What happens when CWF ends

After fluoridation ended in Alaska's capital city, the average low-income child needed **1 additional procedure each year** to treat tooth decay



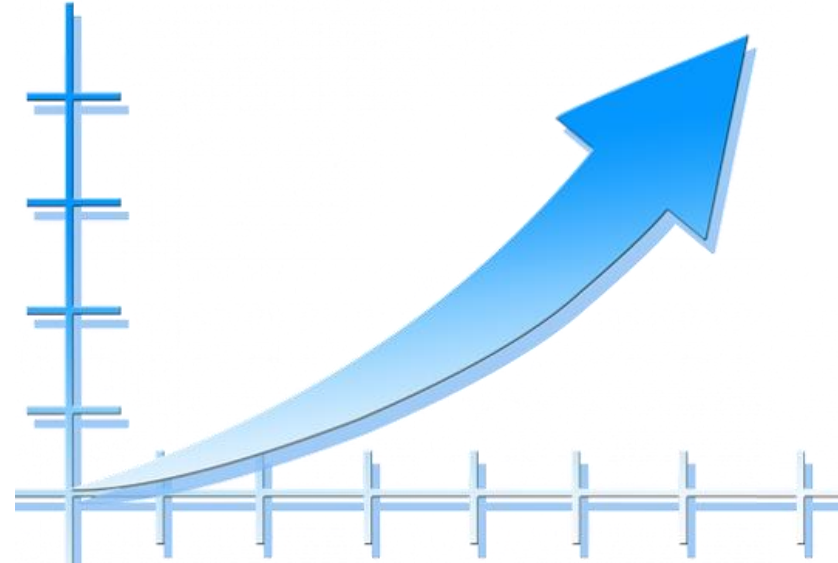
What happens when CWF ends

- In 2016, a study was published examining tooth decay trends among 2nd grade children in two Canadian cities: **Calgary** and **Edmonton**.
- Calgary had ceased fluoridation in 2011. Edmonton remained fluoridated throughout the period that was studied.



What happens when CWF ends

- In order to compare apples to apples, the study examined tooth decay rates in both cities at the same two points.
- The cavity rate for Calgary children jumped **146%** after fluoridation ceased.
- Although decay also rose in Edmonton during this period, cavities in Calgary rose at **3 times the rate** of Edmonton.



What happens when CWF ends

In Canada, the city of **Windsor** voted to resume CWF after their public health unit released data showing a **51% increase** in cavities and emergency dental needs.



4. Why do we know that fluoridation is safe?

Numerous reviews and studies support CWF's safety

- **National Toxicology Program (2018)**
- Food Safety Authority of Ireland (2018)
- **Environmental Protection Agency (2017)**
- National Health & Medical Research Council of Australia (2016)
- **Water Research Foundation (2015)**
- Public Health England (2014, 2018)
- Royal Society of New Zealand (2014)
- Community Preventive Services Task Force (2013)
- Calif. Office of Environmental Health Hazard Assessment (2011)
- **National Research Council (2006, 1993, 1977 & 1951)**
- Irish Forum on Fluoridation (2002)
- U.S. Public Health Service (1991)
- Britain's Royal College of Physicians (1976)
- Univ. of Michigan School of Public Health (1960)

Research confirms fluoridation's safety

Opponents: *“Fluoride is a developmental neurotoxin.”*

- 1** This is the only recent study done in a country where water fluoridation is common
- 2** This is the only study that tested people's IQs over a 30-year period
- 3** This study had a sample size that is much larger than any study cited by opponents



Community Water Fluoridation and Intelligence:

Prospective Study in New Zealand

OBJECTIVES:

This study aimed to clarify the relationship between community water fluoridation (CWF) and IQ.

METHODS:

We conducted a prospective study of a general population sample of those born in Dunedin, New Zealand, between April 1, 1972, and March 30, 1973 (95.4% retention of cohort after 38 years of prospective follow-up). Residence in a CWF area, use of fluoride dentifrice and intake of 0.5-milligram fluoride tablets were assessed in early life (prior to age 5 years); we assessed IQ repeatedly between ages 7 to 13 years and at age 38 years.

CONCLUSIONS:

These findings do not support the assertion that fluoride in the context of CWF programs is neurotoxic. Associations between very high fluoride exposure and low IQ reported in previous studies may

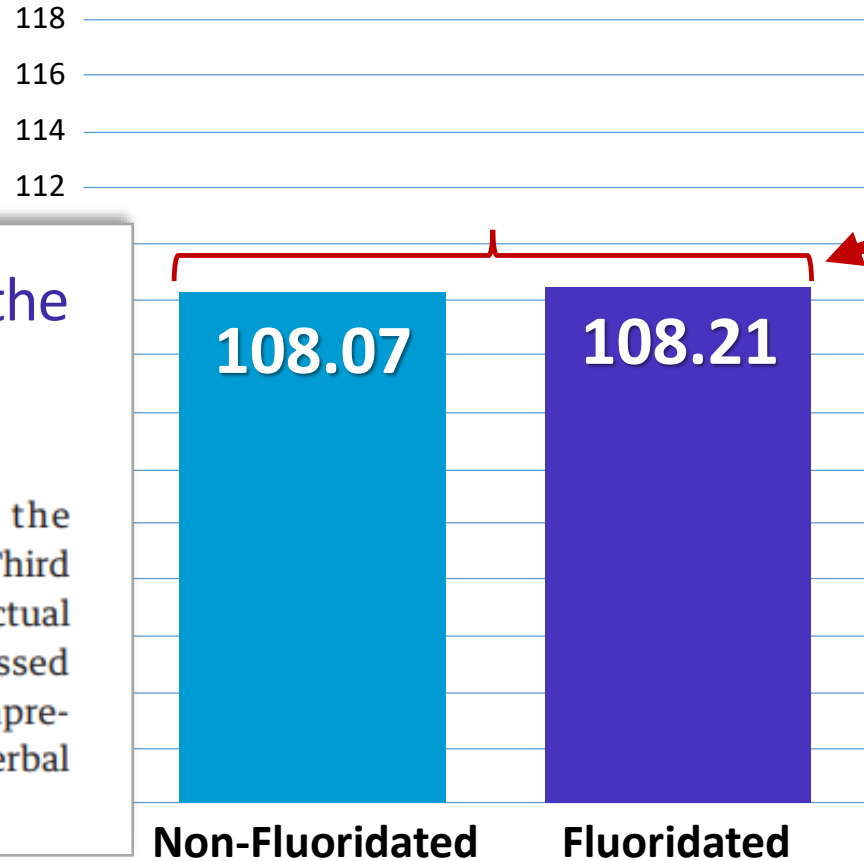
What did the Green study reveal?

The average IQ score of 3 and 4 year-old children in Canada by

Even the Green coauthors call this “the primary outcome” of their study:

Primary Outcomes

We assessed children’s intellectual abilities with the Wechsler Preschool and Primary Scale of Intelligence, Third Edition. Full Scale IQ (FSIQ), a measure of global intellectual functioning, was the primary outcome. We also assessed verbal IQ (VIQ), representing verbal reasoning and comprehension, and performance IQ (PIQ), representing nonverbal reasoning, spatial processing, and visual-motor skills.



The difference in the average IQ score was only **0.14 pts.**

Research confirms fluoridation's safety

Opponents: *“The EPA should review our petition.”*

In 2017, the EPA carefully reviewed their petition — and rejected it.



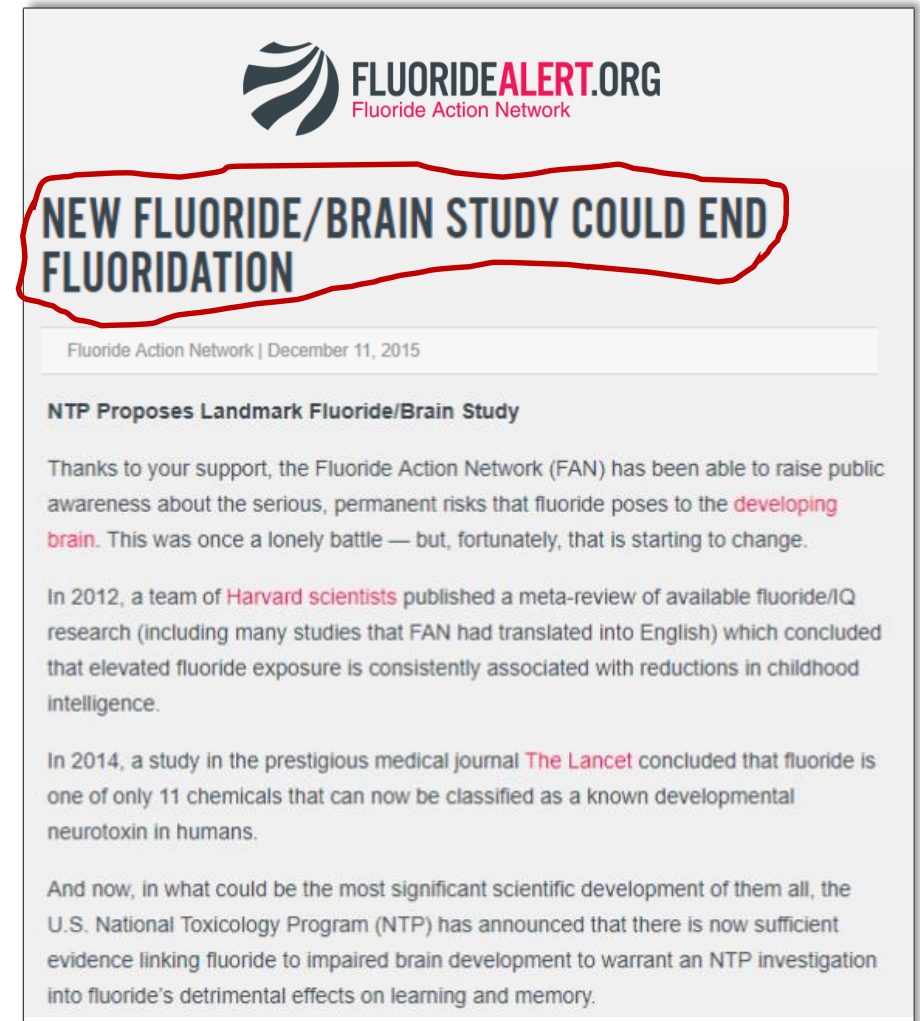
The petition “has **not** set forth a scientifically defensible basis to conclude that any persons have suffered neurotoxic harm” from water fluoridation.


Research confirms fluoridation's safety

Opponents: “The NTP should conduct a study.”

(Source: C.A. McPherson et al., “An Evaluation of Neurotoxicity Following Fluoride Exposure from Gestational Through Adult Ages in Long-Evans Hooded Rats,” *Neurotoxicity Research*, 2018; Article from FAN’s website was written by Michael Connett, Dec. 11, 2015; Note: The statement in quotations is intended to paraphrase the kinds of assertions that opponents have made; it is not a verbatim quotation by a specific individual.)

- The National Toxicology Program (NTP) conducted a study
- The NTP “observed no exposure-related differences in motor, sensory, or learning and memory performance” for any of the 9 tests they conducted
 - Thyroid hormone levels were **not** affected — even at levels of 0, 10 or 20 parts per million of fluoride



 **FLUORIDEALERT.ORG**
Fluoride Action Network

NEW FLUORIDE/BRAIN STUDY COULD END FLUORIDATION

Fluoride Action Network | December 11, 2015

NTP Proposes Landmark Fluoride/Brain Study

Thanks to your support, the Fluoride Action Network (FAN) has been able to raise public awareness about the serious, permanent risks that fluoride poses to the **developing brain**. This was once a lonely battle — but, fortunately, that is starting to change.

In 2012, a team of **Harvard scientists** published a meta-review of available fluoride/IQ research (including many studies that FAN had translated into English) which concluded that elevated fluoride exposure is consistently associated with reductions in childhood intelligence.

In 2014, a study in the prestigious medical journal **The Lancet** concluded that fluoride is one of only 11 chemicals that can now be classified as a known developmental neurotoxin in humans.

And now, in what could be the most significant scientific development of them all, the U.S. National Toxicology Program (NTP) has announced that there is now sufficient evidence linking fluoride to impaired brain development to warrant an NTP investigation into fluoride's detrimental effects on learning and memory.

Research confirms fluoridation's safety

Opponents: *“Mother nature protects babies from fluoride.”*

- Breast feeding is encouraged by leading scientific groups (nutrition, antibodies, etc.).
- **However** . . . breast milk is not perfect.*
For example, it lacks sufficient:
 - Vitamin D (brittle bones)
 - Vitamin K (clotting)
 - Iron (anemia)



Research confirms fluoridation's safety

Opponents: *“Fluoride harms the thyroid gland.”*

This 2017 Canadian study showed **no link** between fluoridated water and thyroid problems.

“There was no evidence of a relationship between fluoride exposure (from urine and tap water) and the diagnosis of a thyroid condition.”

Research confirms fluoridation's safety

Opponents: *“Fluoride additives are not pharmaceutical grade.”*



What the CDC says:

“Some have suggested that pharmaceutical grade fluoride additives should be used for water fluoridation. **Pharmaceutical grading standards used in formulating prescription drugs are not appropriate for water fluoridation additives.** If applied, those standards could actually exceed the amount of impurities allowed by AWWA and NSF/ANSI in drinking water.”

Research confirms fluoridation's safety

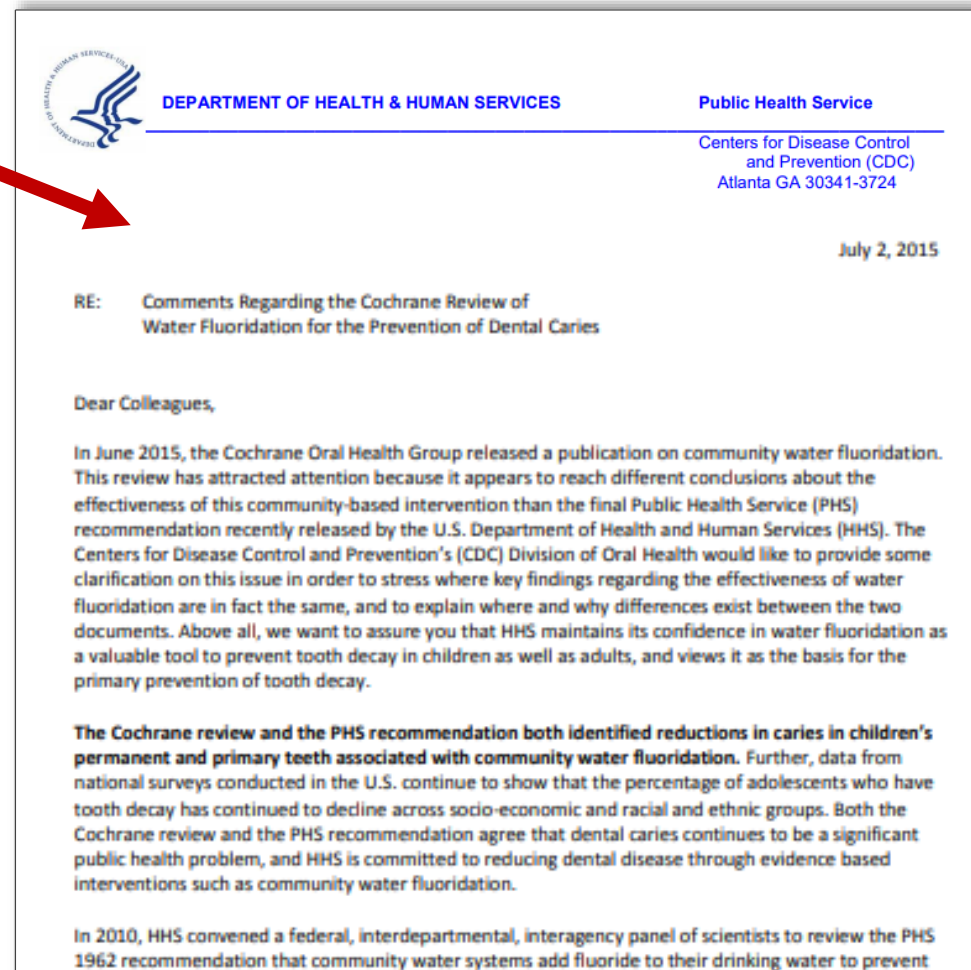
Opponents: “RCTs have never been done on fluoridation.”

- RCTs are a form of research that “is often not feasible for interventions that occur on a community level, like community water fluoridation.”

- **Observational studies** are commonly used for CWF and have been used for:

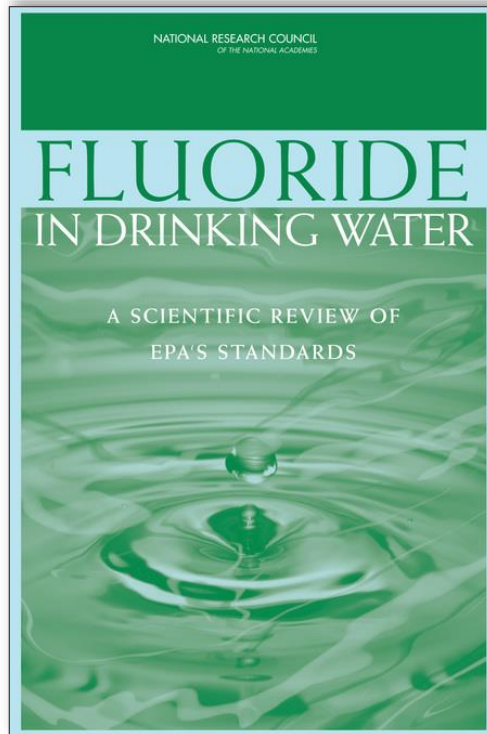
- ✓ Smoking & lung disease
- ✓ Sexually Transmitted Diseases
- ✓ Chronic Alcohol Use

(Source: K. Weno, CDC, “Comments Regarding the Cochrane Review of Water Fluoridation for the Prevention of Dental Caries, July 2, 2015.)



Research confirms fluoridation's safety

Opponents: *“NRC’s 2006 report shows CWF is harmful.”*

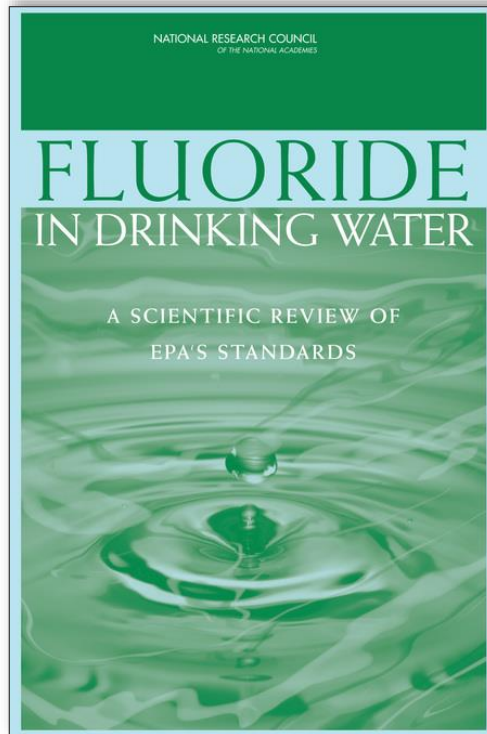


BACKGROUND:

- In 2006, NRC evaluated the appropriate limit on naturally occurring fluoride level* in water to confirm that current limit (4 mg/L) is still protective of health.
- 200,000+ Americans live in areas where the natural fluoride level exceeds 4 mg/L.

Research confirms fluoridation's safety

Opponents: *“NRC’s 2006 report shows CWF is harmful.”*



FACTS:

As the report explained, the EPA's maximum limit on fluoride is “set at a concentration at which **no adverse health effects** are expected to occur and the margins of safety are judged ‘adequate’.”

Research confirms fluoridation's safety

Opponents: "NRC's 2006 report shows CWF is harmful."

Was there definitive evidence at 4.0 ppm showing that fluoride had an effect on...?

- Tooth enamel ✓
- Liver ✗
- Kidneys ✗
- Endocrine system ✗
- Gastrointestinal system ✗
- Immune system ✗
- Cancer ✗
- Musculoskeletal system ✗
- Reproduction and development ✗
- Neurotoxicity and neurobehavioral ✗
- Genetic damage ✗

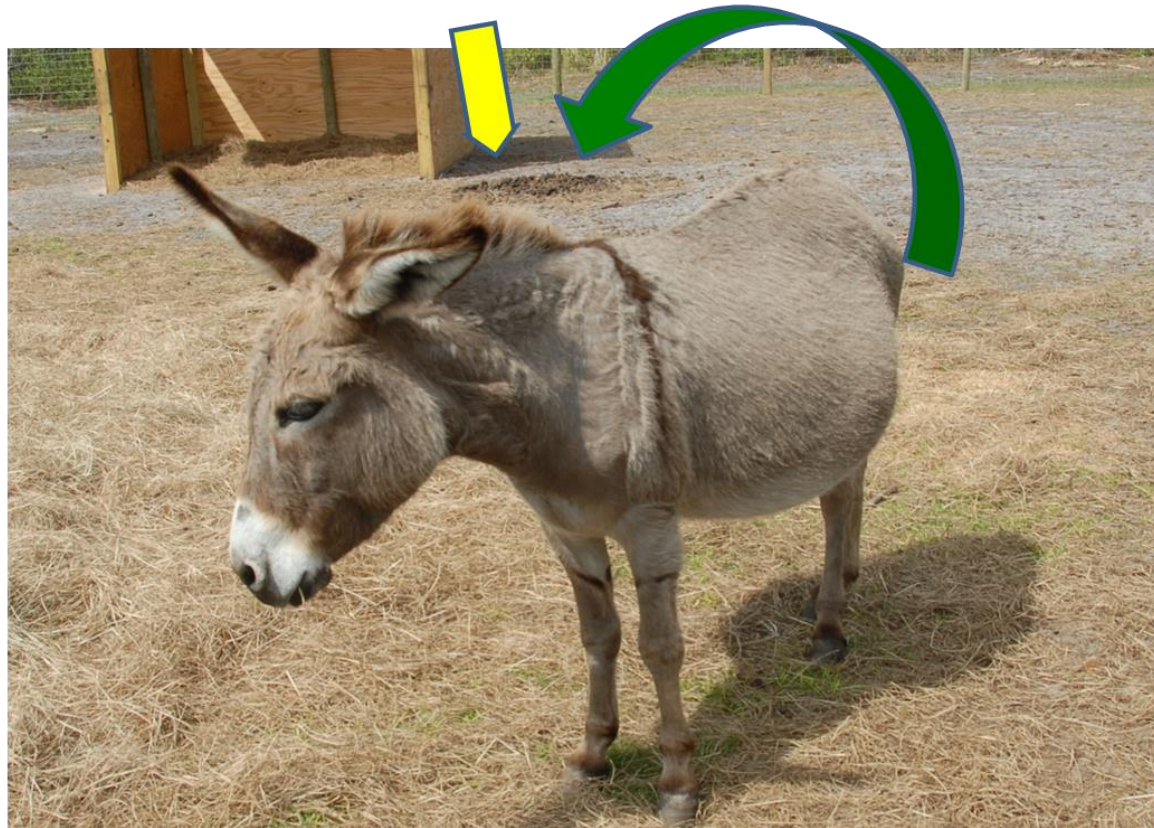
**5. Why do a small
group of people
oppose fluoridation?**

A long list of false claims by fluoridation opponents

- No toxicological testing has been conducted on fluoride
- The ADA says it shouldn't be used in infant formula
- Fluorosis is a sign of toxic effects
- It causes ADHD
- It causes Alzheimer's
- It harms the kidney, the immune system and other systems
- It's a conspiracy — the phosphate fertilizer industry is disposing of its "hazardous waste"
- Cavities have fallen in all nations, so fluoridation must not matter
- Some people are allergic to fluoridated water
- It causes thyroid problems
- The only way fluoride works is by topical application
- This is "forced medication"
- The Cochrane Group says there's no evidence behind fluoridation
- Water systems should use a pharmaceutical grade of fluoride

Opponents to CWF: Strategies

Throw it at the wall often and hope something sticks



Critics call it “mass medication”

- America has a tradition of fortifying foods and drinks to improve human health:

- ✓ Folic acid
- ✓ Calcium
- ✓ Vitamin D
- ✓ Iodine



- U.S. courts have consistently **rejected** this argument against fluoridation.
- Fluoridation (like chlorination) is about **prevention**.

Critics distort oral health data

Figure 1: Data from WHO Database

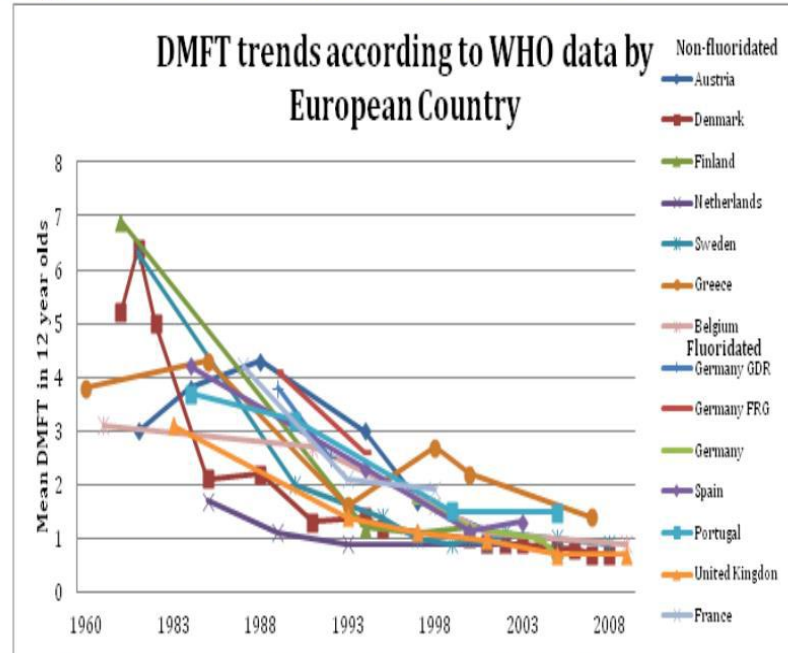


Figure 2: Data manipulated to show linear trend

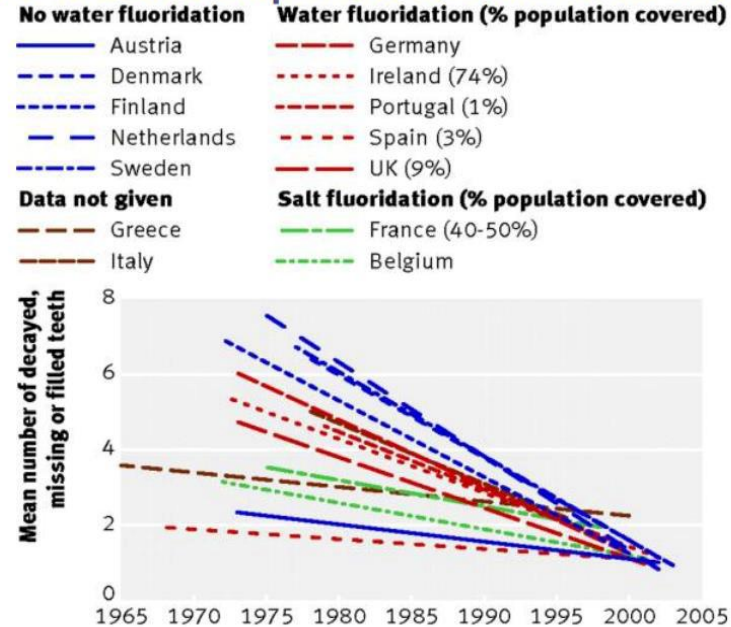


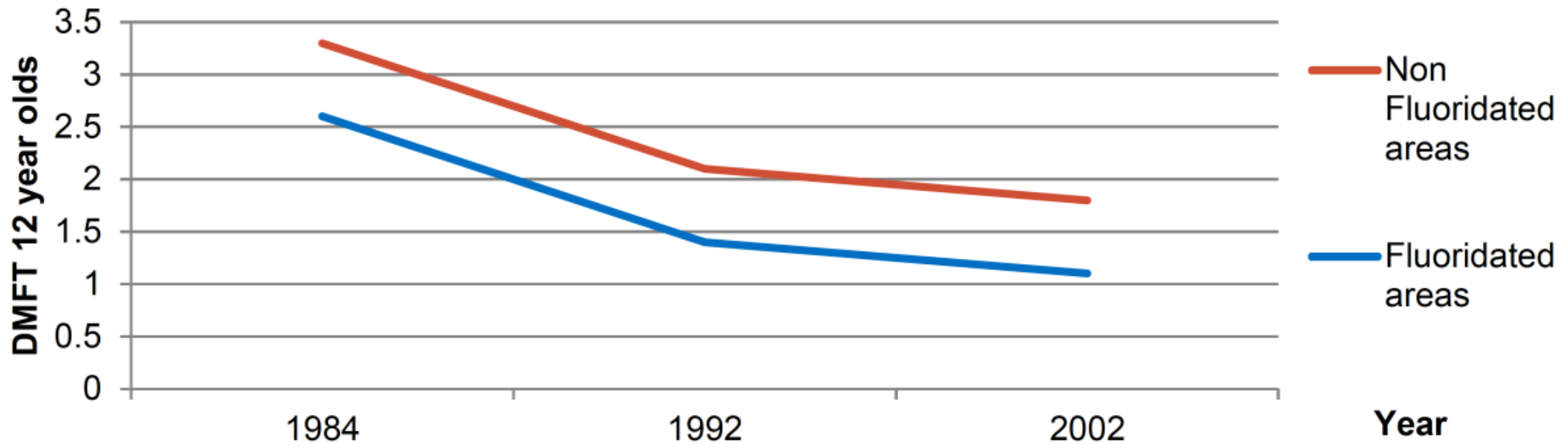
Figure 1 scatter-plot is drawn from data collected by the World Health Organization. Figure 2 is attributed to Cheng et al., "Adding fluoride to water supplies," BMJ, 2007, 335:7622.

- The chart on the left is data from the World Health Organization

- The chart on the right is by opponents of water fluoridation. Straightened out true data points

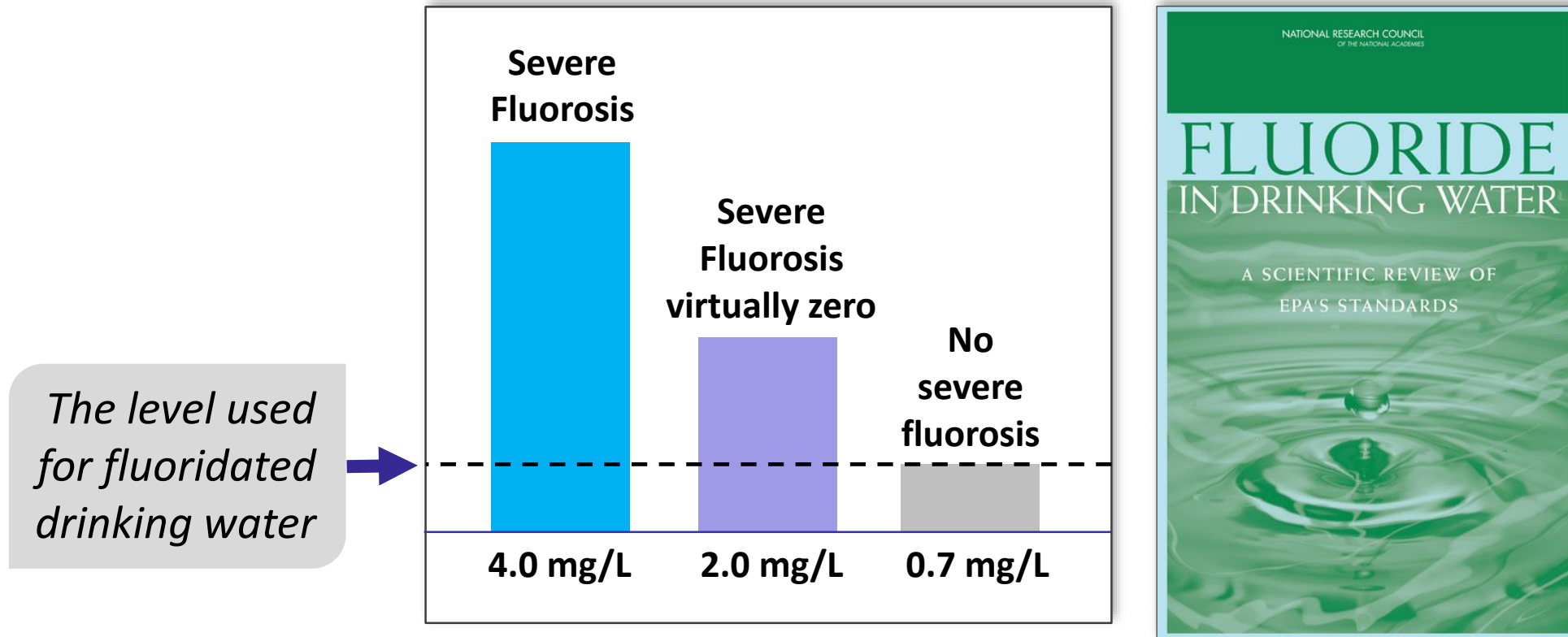
A clear benefit from fluoridation

A chart like this compares apples to apples. Children in Ireland who live in fluoridated areas have lower rates of decay



6. What do we know about dental fluorosis?

Critics distort the facts about dental fluorosis



Dental fluorosis

What is dental fluorosis?

- Dental fluorosis is a change in the appearance of tooth enamel caused by high intakes of fluoride during the tooth-forming years.

Dental fluorosis

What effect does it have?

- Dental fluorosis is a change in the appearance of tooth enamel caused by high intakes of fluoride during the tooth-forming years.
- Dental fluorosis is typically a mild cosmetic effect:
 - It does not cause pain
 - It does not affect the health or function of teeth
 - It is so subtle most people don't even notice it

Dental fluorosis

When can
it occur?

- Dental fluorosis is a change in the appearance of tooth enamel caused by high intakes of fluoride during the tooth-forming years.
- Dental fluorosis is typically a mild cosmetic effect:
 - It does not cause pain
 - It does not affect the health or function of teeth
 - It is so subtle most people don't even notice it
- Dental fluorosis can only occur **up to 8 years of age** while permanent teeth are developing.

Critics distort the facts about dental fluorosis

Variations in tooth enamel (fluorosis)



Normal



Very Mild



Moderate

Improper
use of
fluoride
products



Questionable



Mild



Severe

Not
caused
by CWF

Critics distort the facts about dental fluorosis

Opponents distort the facts about fluorosis

Which would you rather have?

Cavities

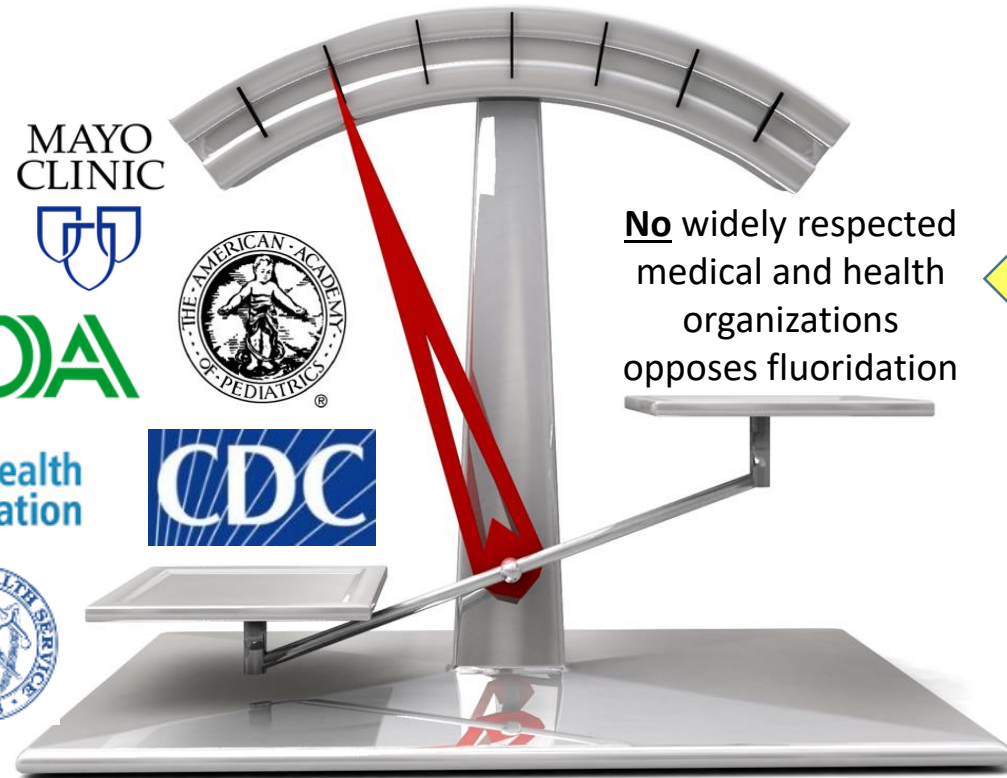
OR

Mild fluorosis



7. Final thoughts about fluoridation

The clear weight of the science



No widely respected
medical and health
organizations
opposes fluoridation



Summary . . .

- ☑ **Effective** at reducing cavities
- ☑ **Safe** — no adverse health effects
- ☑ **Saves money** — in fact, the average person saves \$32.19 per year in dental costs. **Over \$13 million CWF saved NH**
- ☑ Prevention that **benefits everyone** in the community (just by turning on the tap)
- ☑ **Recommended by the most respected health/medical organizations:** CDC, American Academy of Pediatrics and the ADA

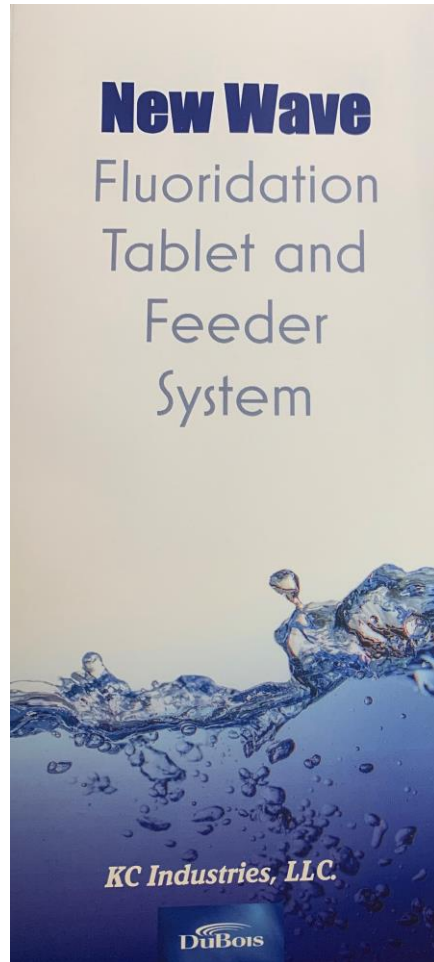
12 year old first time hunting



Florida Osceola Turkey



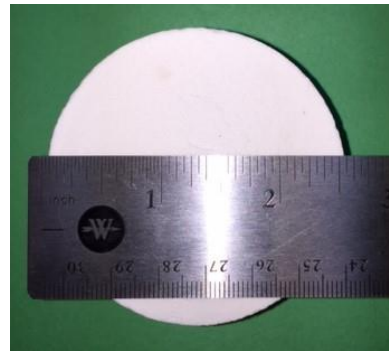
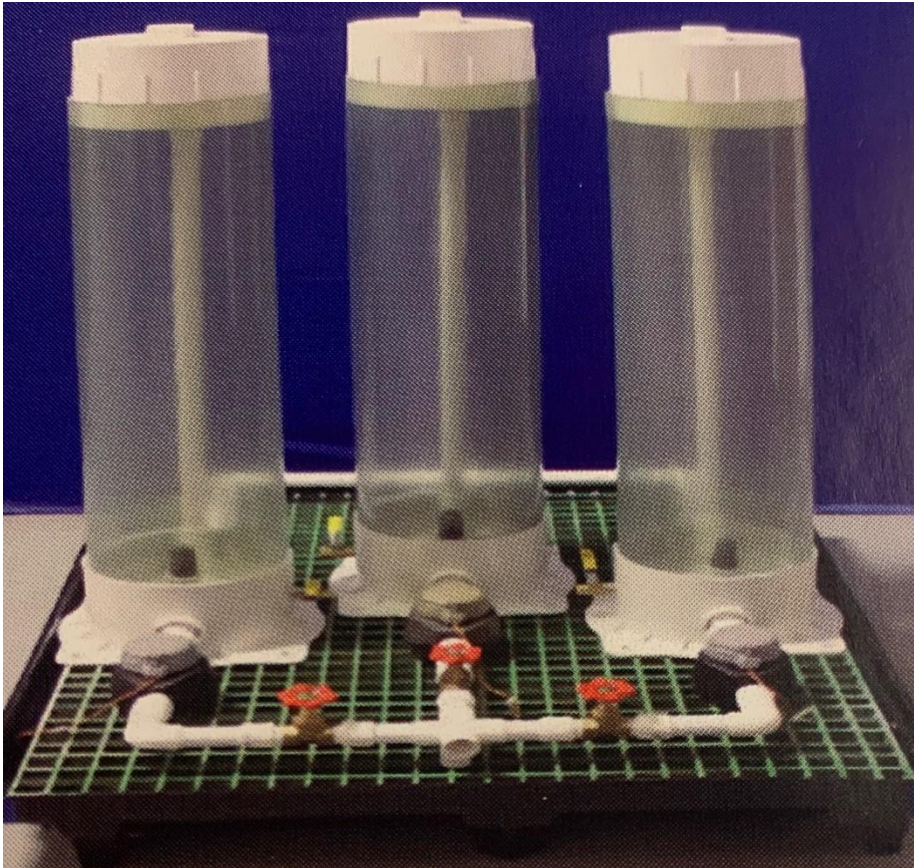
Need for a CWF system for small communities



WHY A NEW FLUORIDE DELIVERY PRODUCT?

- Approximately 25% of the USA population does not have access to fluoridated water, mostly smaller PWS (public water systems)
- Demand for a simple, passive fluoridation system familiar to operators of small PWS
- Need for easier handling and reduced safety risk
- Desire for Reliable and consistent feeding of fluoride in small quantities
- Reduction of installation cost making it more affordable for small PWS
- Eliminates need for water softening in hard water applications
- Product made in the **USA**

Now on the market! January 1, 2020



- Self contained feeder system
- Tablets are added to the feeder system
- 200 tablets per feeder tube
- Product is released through water erosion of surface area saturation
- Able to fluoridate approximately 300,000 gallons/day per tube at zero background fluoride
- Expandable to 3 feeder tubes
- inquiries@kcindustries.com

Thank You!



Johnny Johnson

President

American Fluoridation Society

Johnny@americanfluoridationsociety.com

NEW and for water operators only!!

Resource for you when you get calls, emails, challenges, or just have a question on CWF:

Water@AFS-Fluoride.org

