

# Region of Peel Educational Session – Artificial Water Fluoridation (AWF)

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# The Debate in Peel: Artificial Water Fluoridation (AWF)

AWF Supporters make the hypothesis that:

**"AWF is Safe and Effective"**

“The great tragedy of Science — the slaying of a beautiful hypothesis by an ugly fact.”

(TH Huxley)

"No amount of experimentation can ever prove me right; a single experiment can prove me wrong."

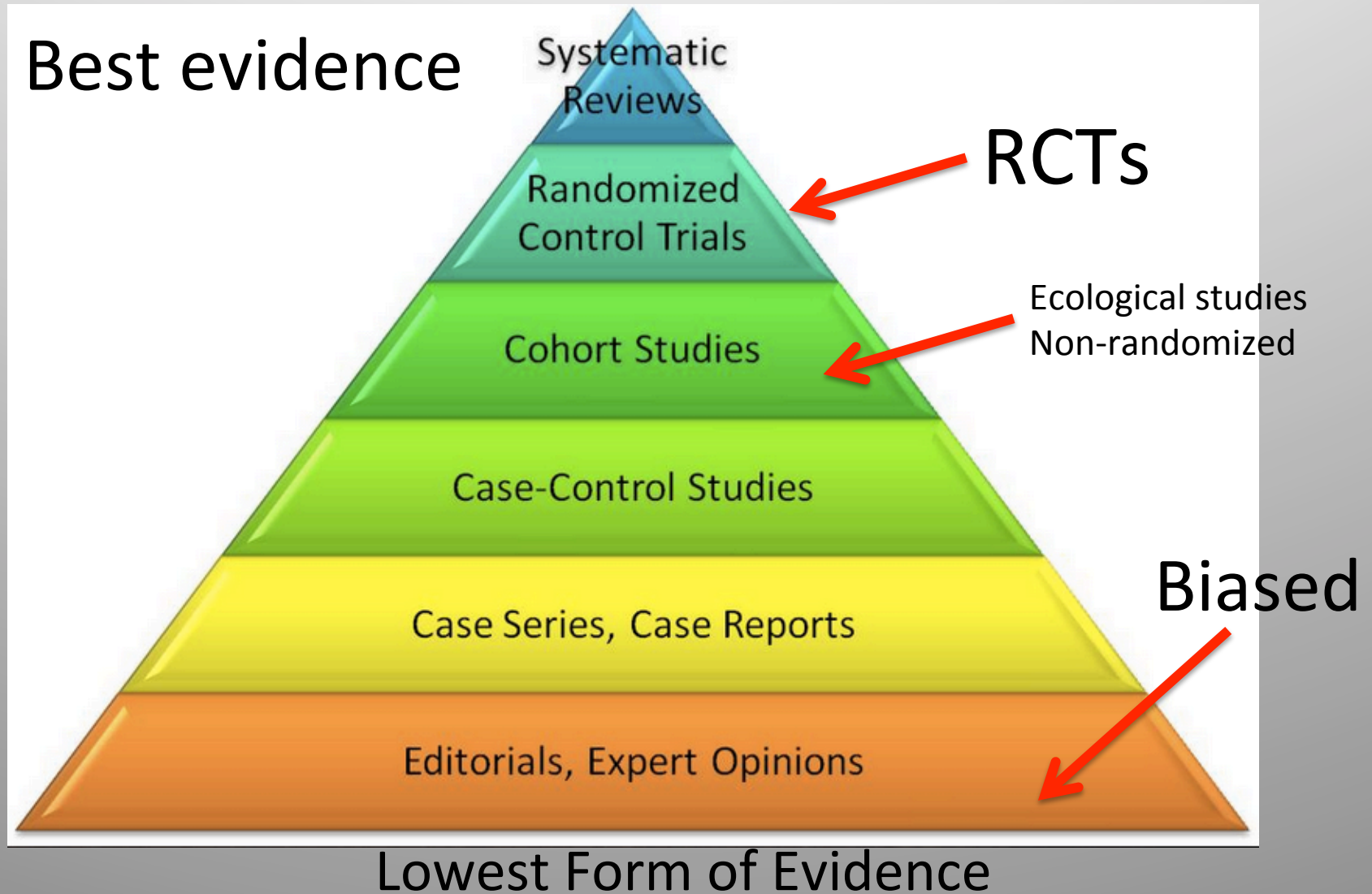
(Albert Einstein)

Paraphrasing Einstein and Huxley:

“No amount of evidence can ever PROVE artificial water fluoridation (AWF) to be safe and effective; a SINGLE 'ugly fact' can show it is not so.”

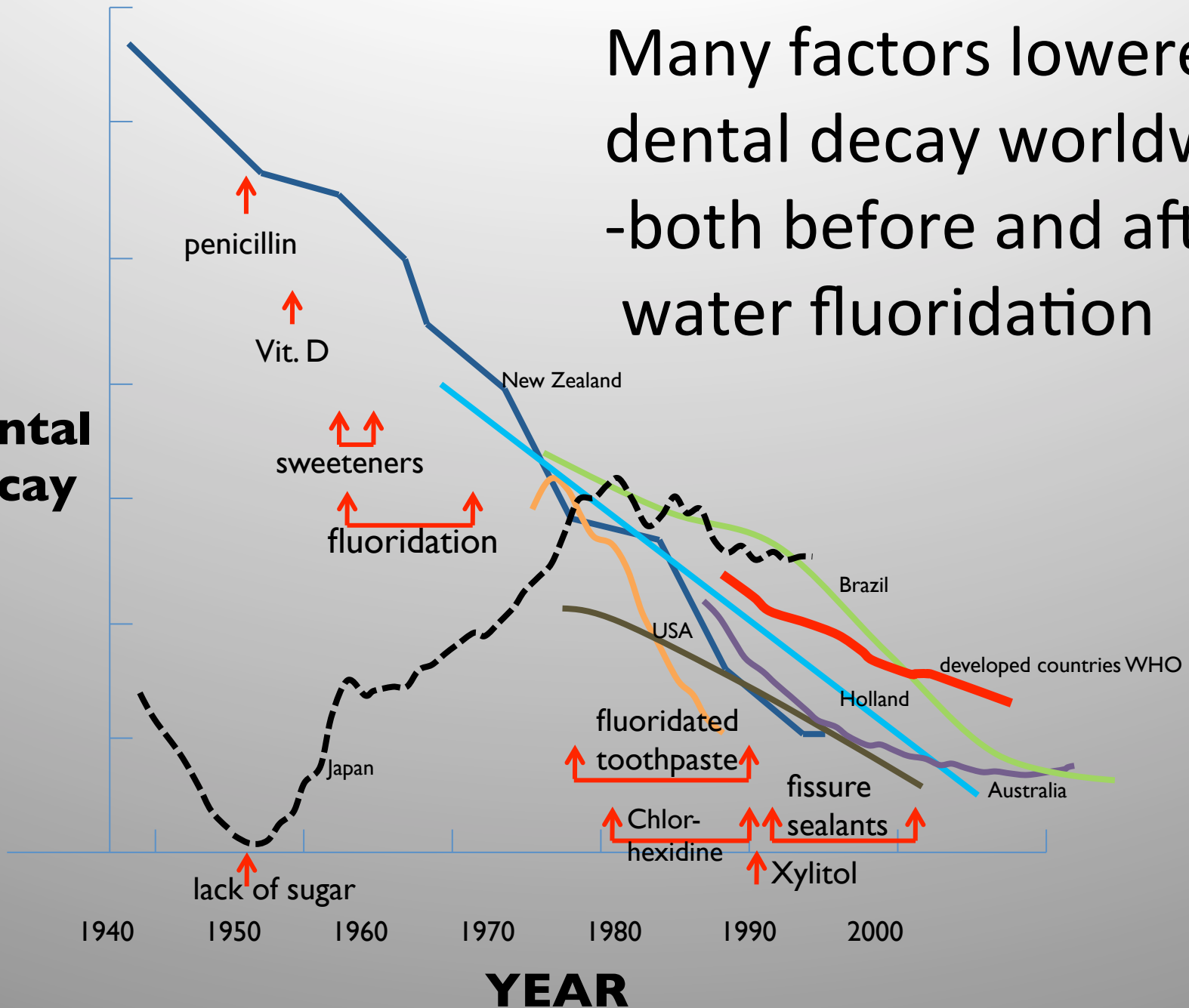
Many ‘ugly facts’ have been published

# Levels of CLINICAL Evidence



Many factors lowered dental decay worldwide -both before and after water fluoridation

**Dental Decay**

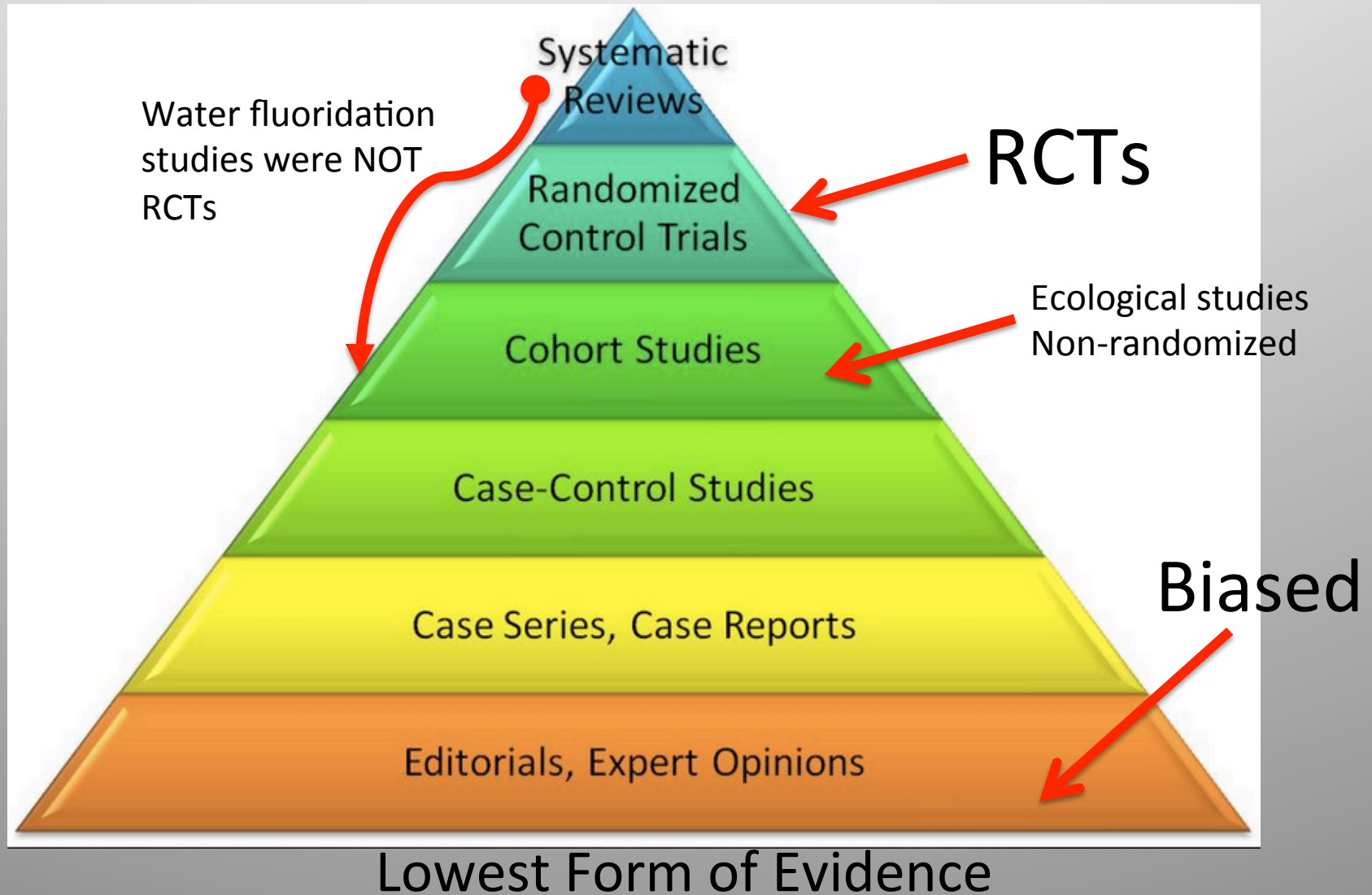


**Water fluoridation to prevent tooth decay**

Iheozor-Ejiofor Z. et al. 2015

- Biased: Funded by the CDC, conducted by oral health epidemiologists
- NOT ONE randomized, double blinded clinical study
- Used weaker studies (non-randomized before and after controlled studies)
- Only 3 studies after 1975 (when fluoridated toothpaste gained widespread use)
- Studies did not control for many confounders (especially delayed tooth eruption)
- Marginal benefit if any at all

# CLINICAL Evidence for 'Effective'



RELATION BETWEEN THE AMOUNT OF DENTAL CARIES  
(PERMANENT TEETH) OBSERVED IN 7257 SELECTED 12-14  
YEAR OLD WHITE SCHOOL CHILDREN OF 21 CITIES OF 4 STATES  
AND THE FLUORIDE (F) CONTENT OF PUBLIC WATER SUPPLY

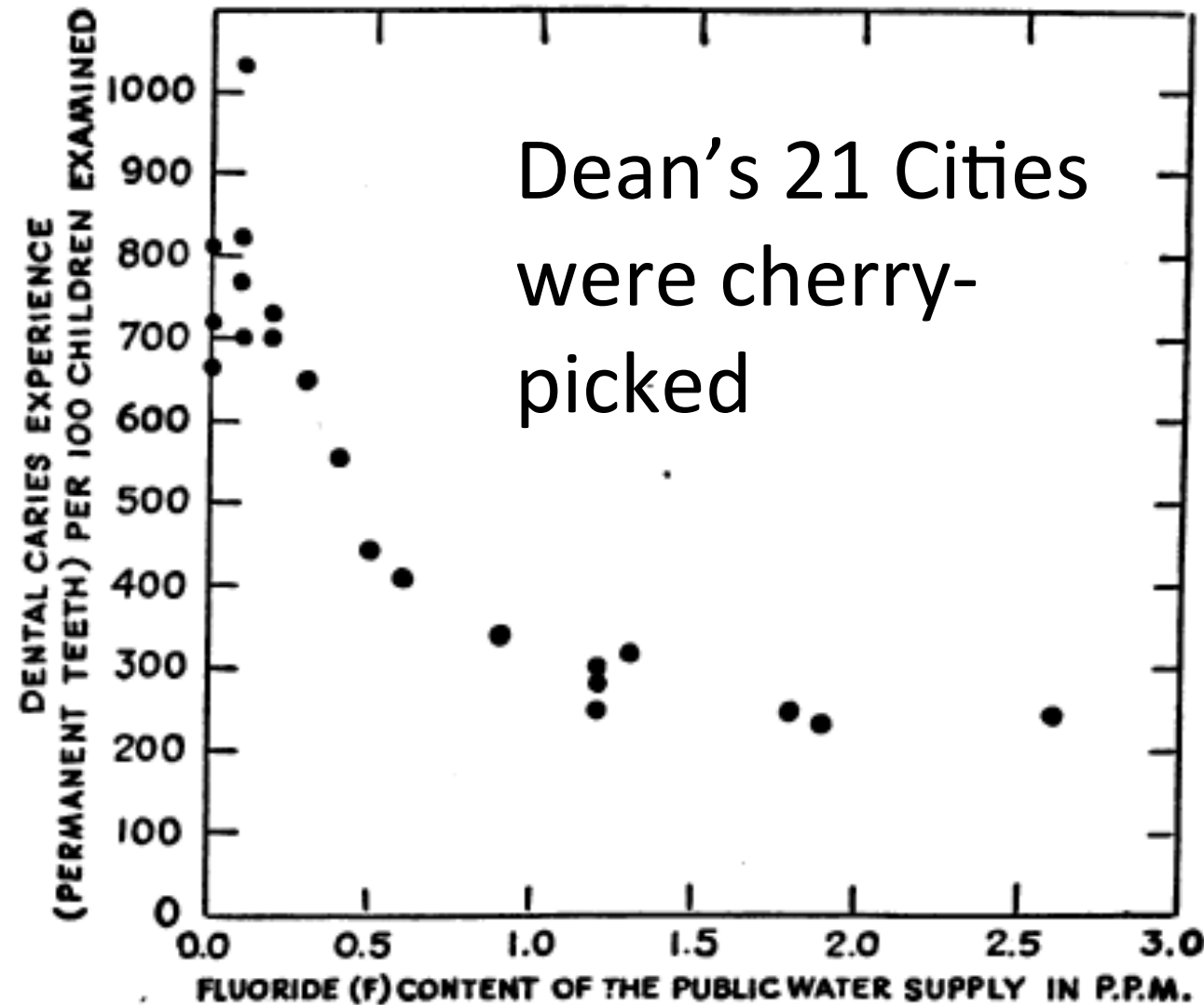
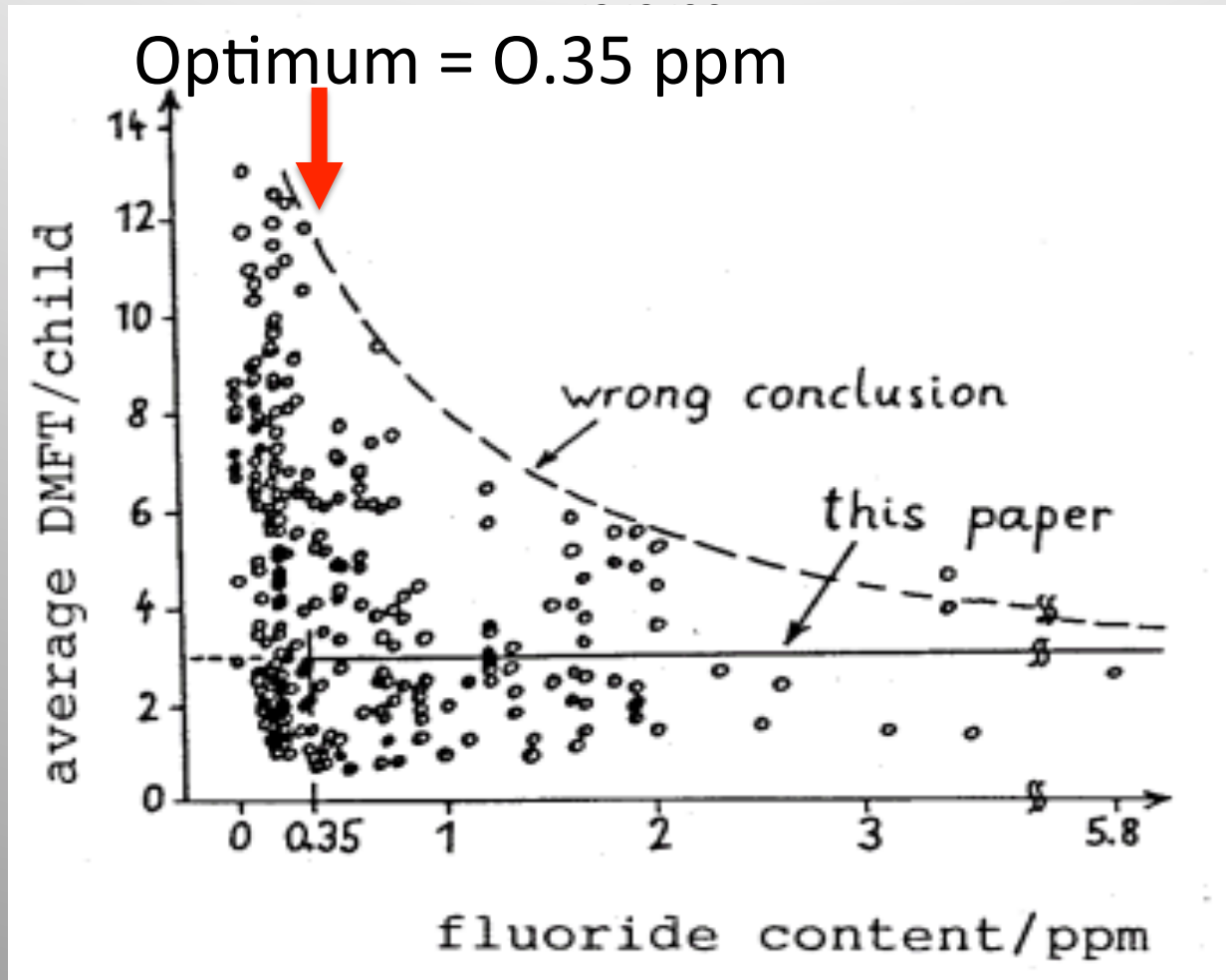


FIGURE 2

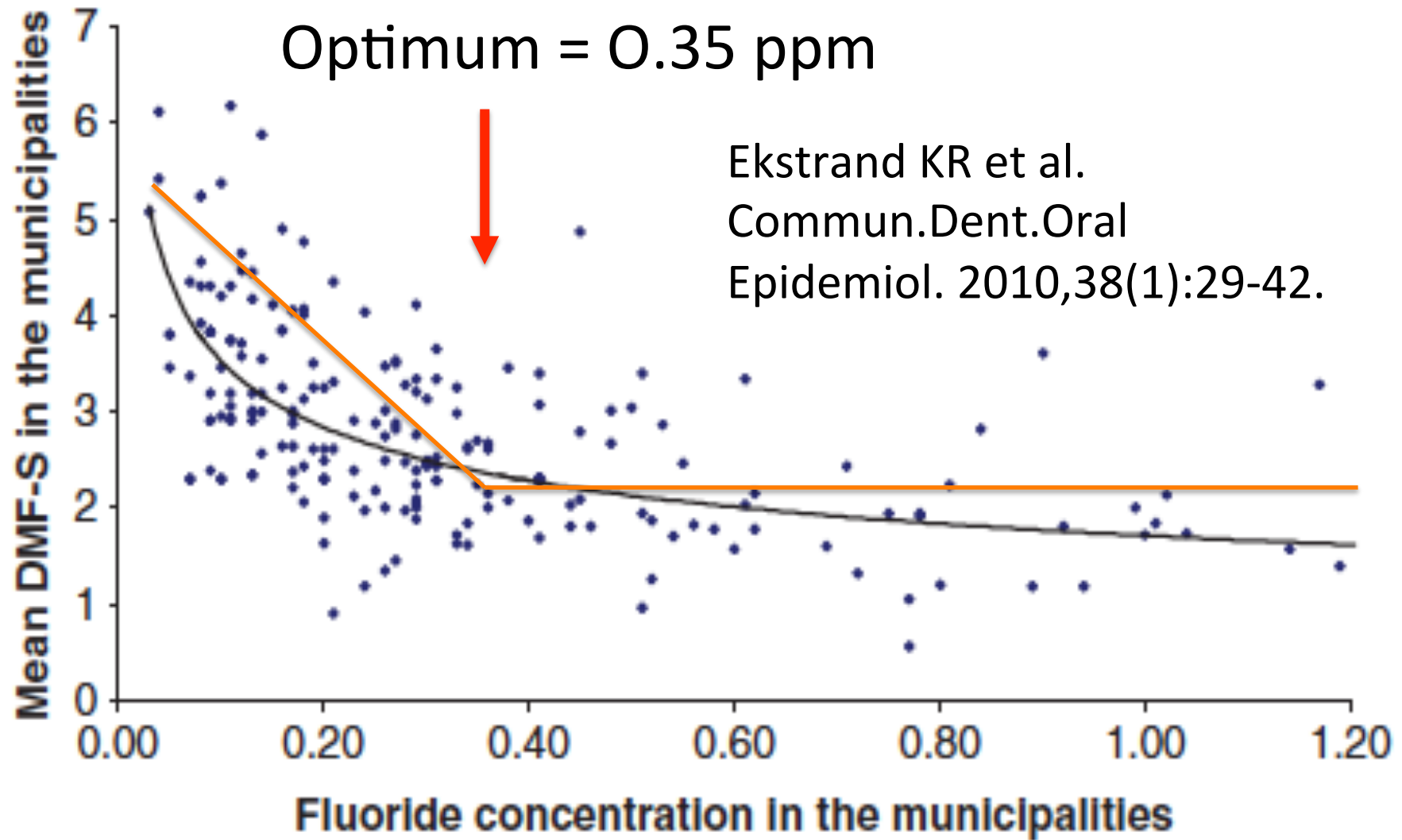
Evidence for  
'effective' is  
weak and still  
based on Dean's  
studies in the  
1940s



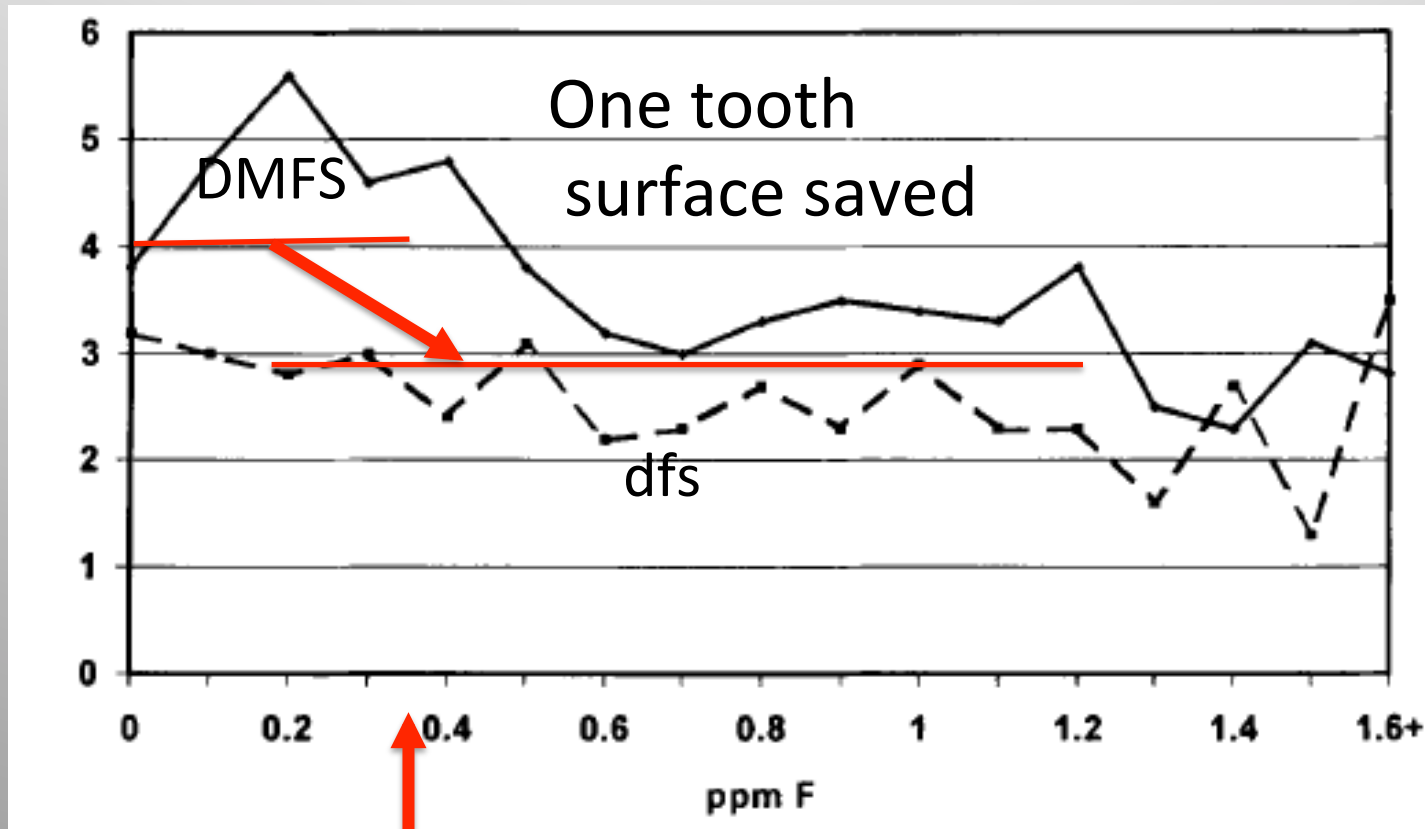
When ALL cities were examined,  
the optimum was closer to 0.35



# New research confirms a lower optimum



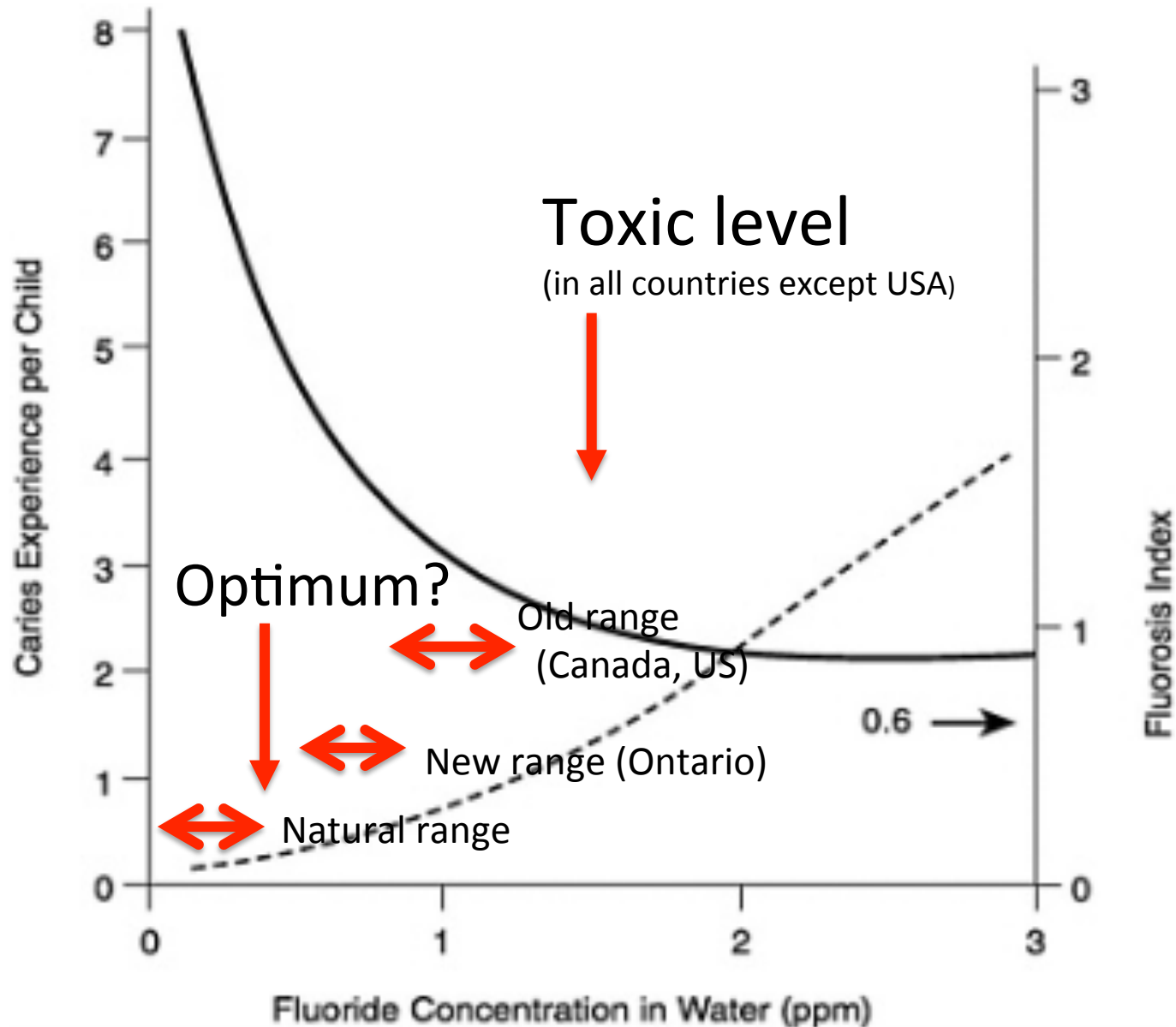
Health Canada looked at only 2 studies



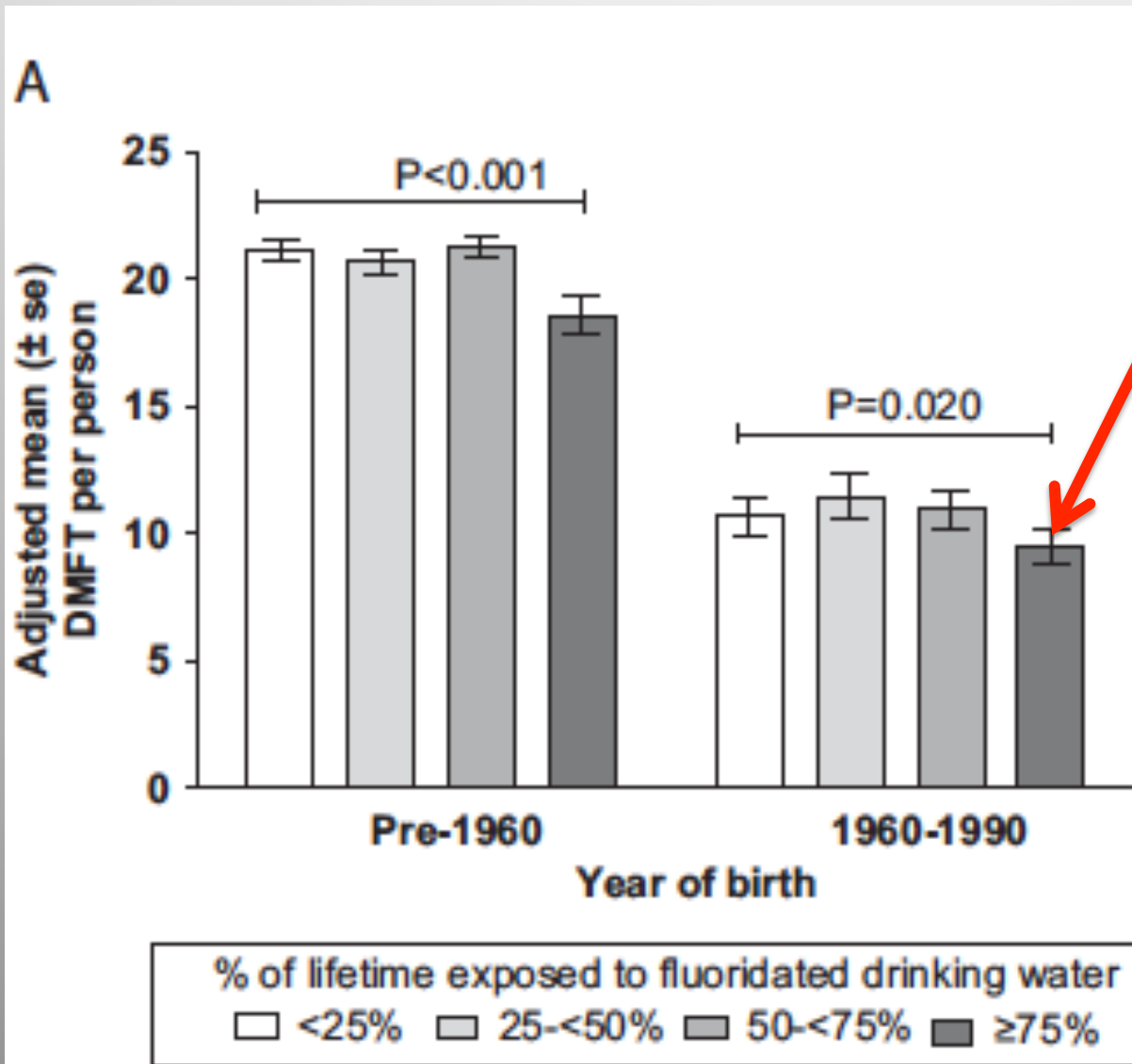
0.35 ppm

Heller, K.E., Eklund, S.A. and Burt, B.A. (1997)  
J. Public Health Dent., 57: 136–143.

# Therapeutic and toxic DOSES overlap



# Fluoridation's benefit is NOT cost effective



A lifetime (40 years) of fluoridation saves maybe ONE dental filling/person

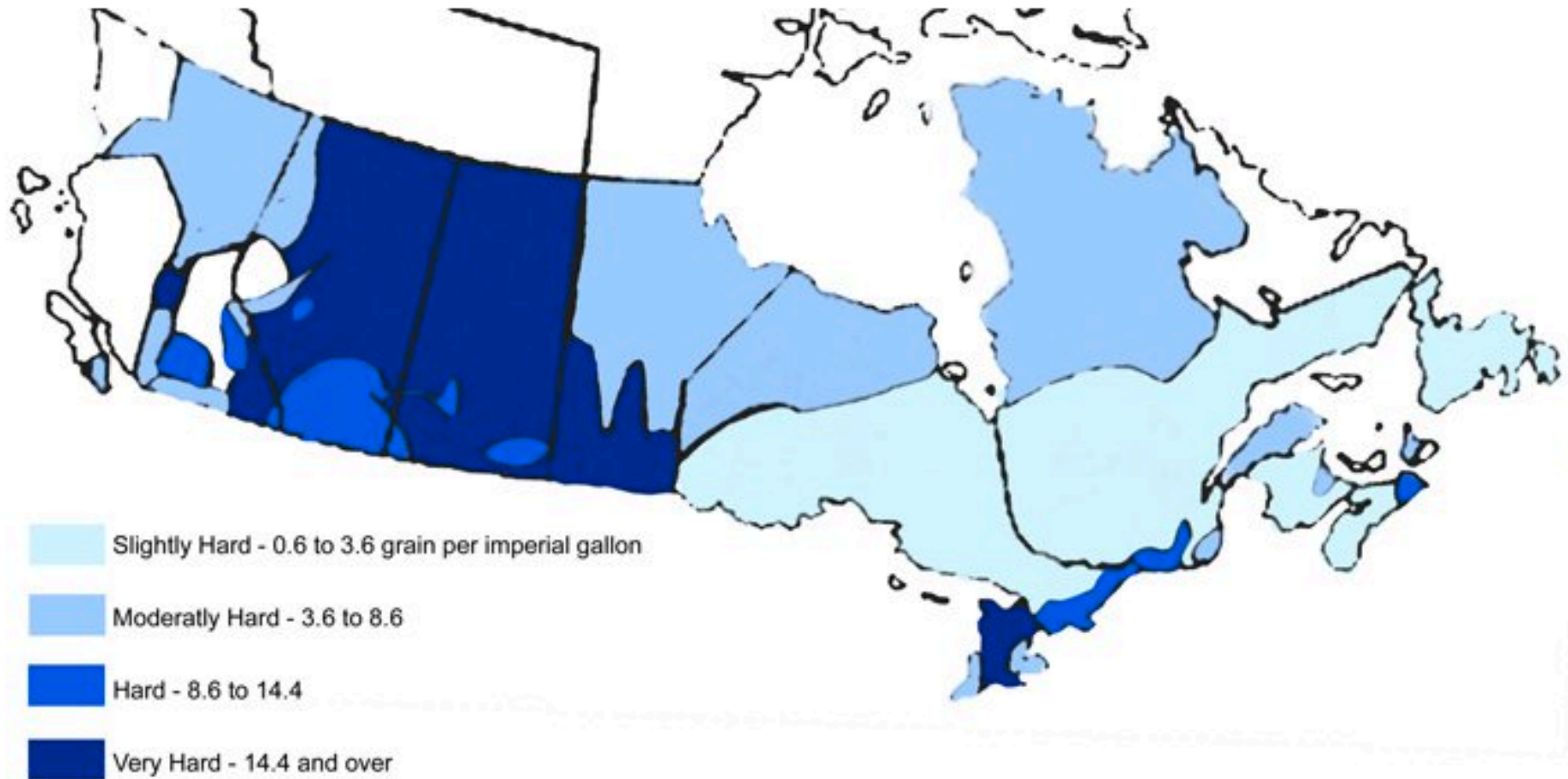
The benefit of fluoride in drinking water cannot be demonstrated without taking into account other trace minerals

Associated with <b>decreased</b> caries	Associated with <b>increased</b> caries
Calcium Magnesium Molybdenum Vanadium Strontium	Copper Iron Manganese

Glass RL et al. *Arch Oral Biol.* 1973 Sep;18(9):1099-104.

Lippert & Hara. *Caries Res.* 2013;47(1):34-49.

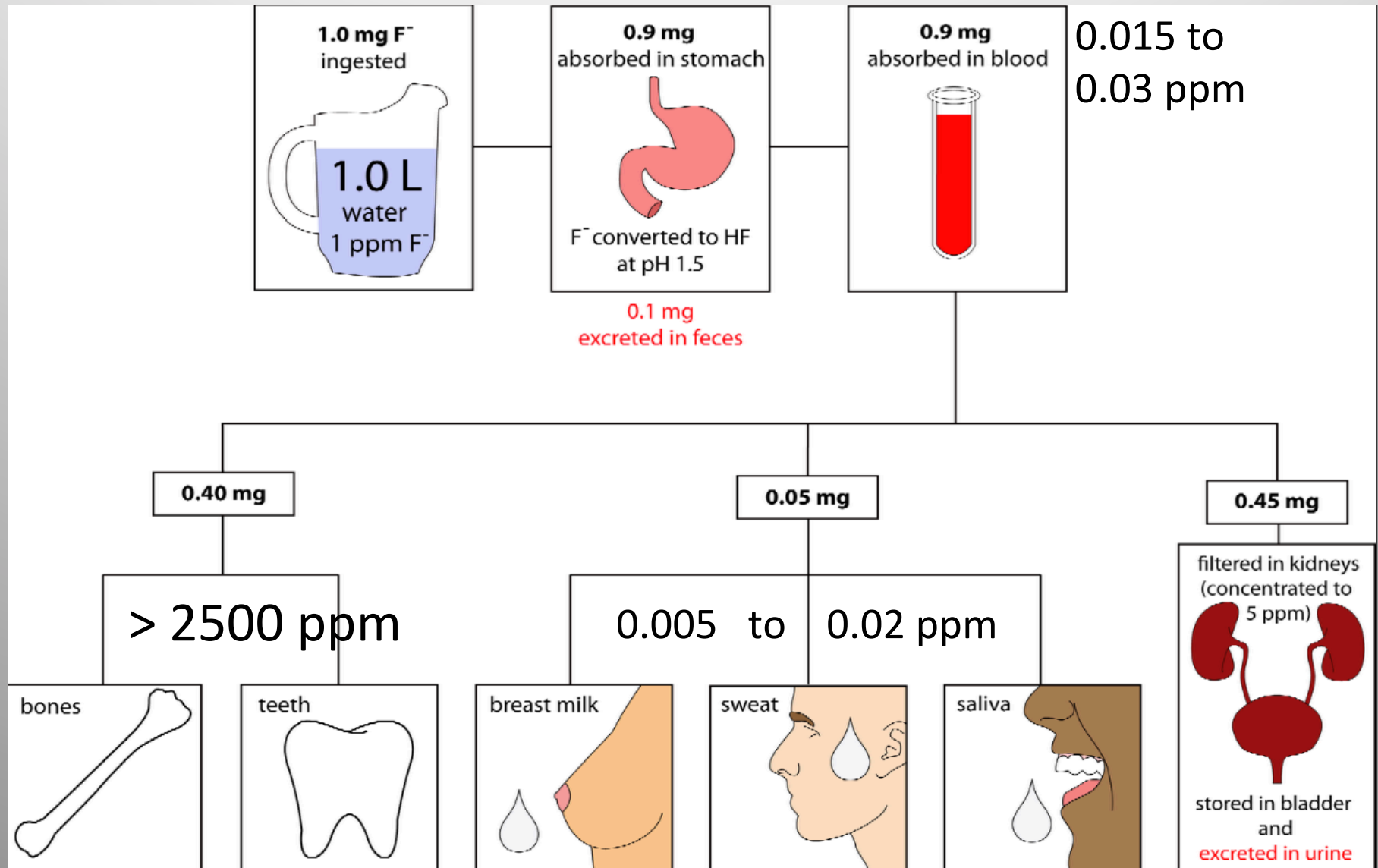
# Water hardness could affect caries AND fluorosis depending on WHERE you live in Canada



Siftocanada.com

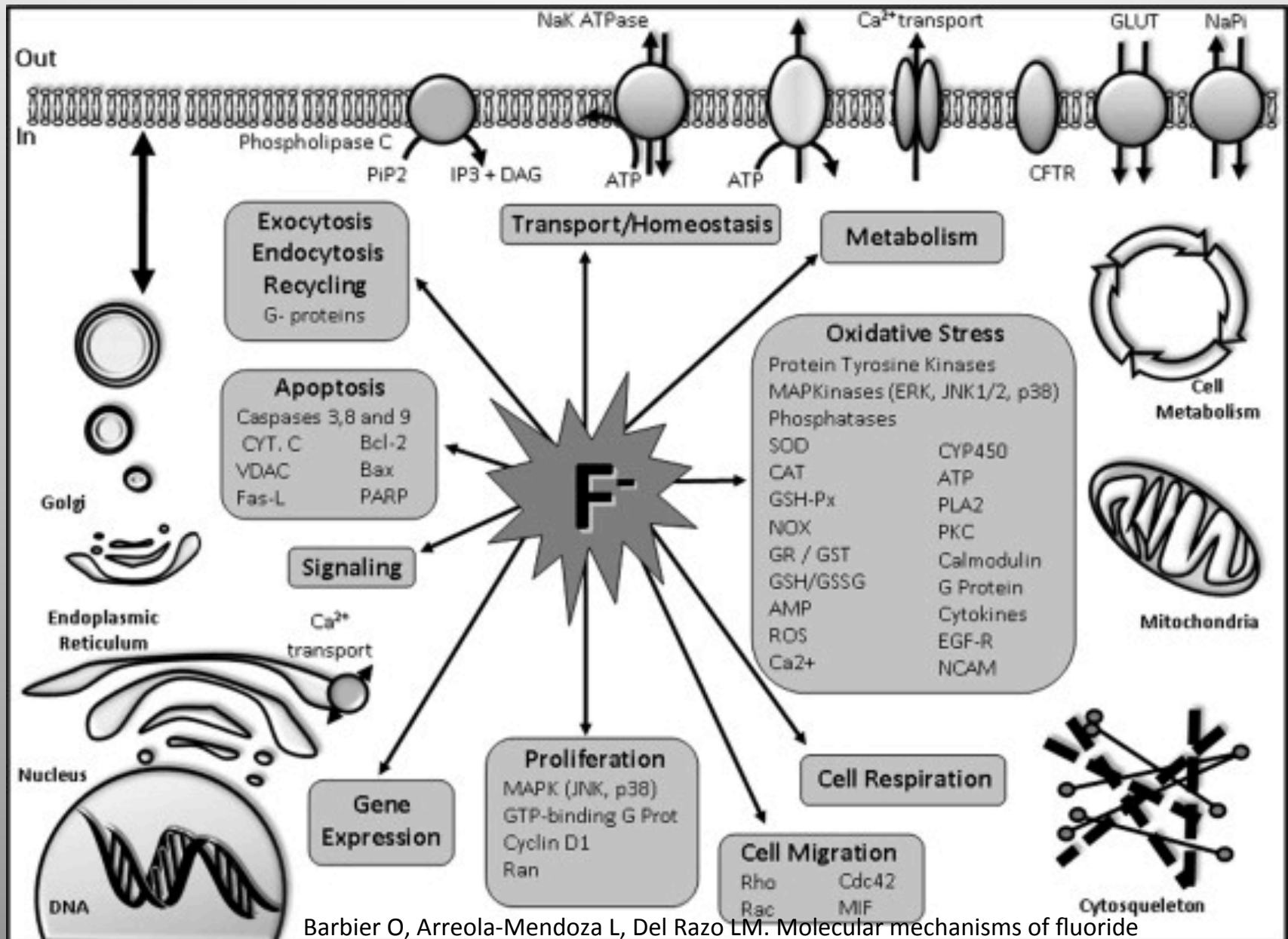
<http://www.water-research.net/hardness.htm>

# Human fluoride Metabolism





# Fluoride effects on human cells



Barbier O, Arreola-Mendoza L, Del Razo LM. Molecular mechanisms of fluoride toxicity. Chem Biol Interact. 2010 Nov 5;188(2):319-33.

# Dental fluorosis DOES get worse with time

Limeback H, Vieira AP, Lawrence H. Improving esthetically objectionable human enamel fluorosis with a simple microabrasion technique. Eur J Oral Sci. 2006 May;114 Suppl 1:123-6;



Age 8



Age 10



-teeth erupt chalky white

-then lose surface enamel  
and pick up stain

**Appearance after microabrasion**

# Fluorosis in Canada

- Every 10<sup>th</sup> child has 'objectionable' fluorosis
- >40% have some signs of fluorosis

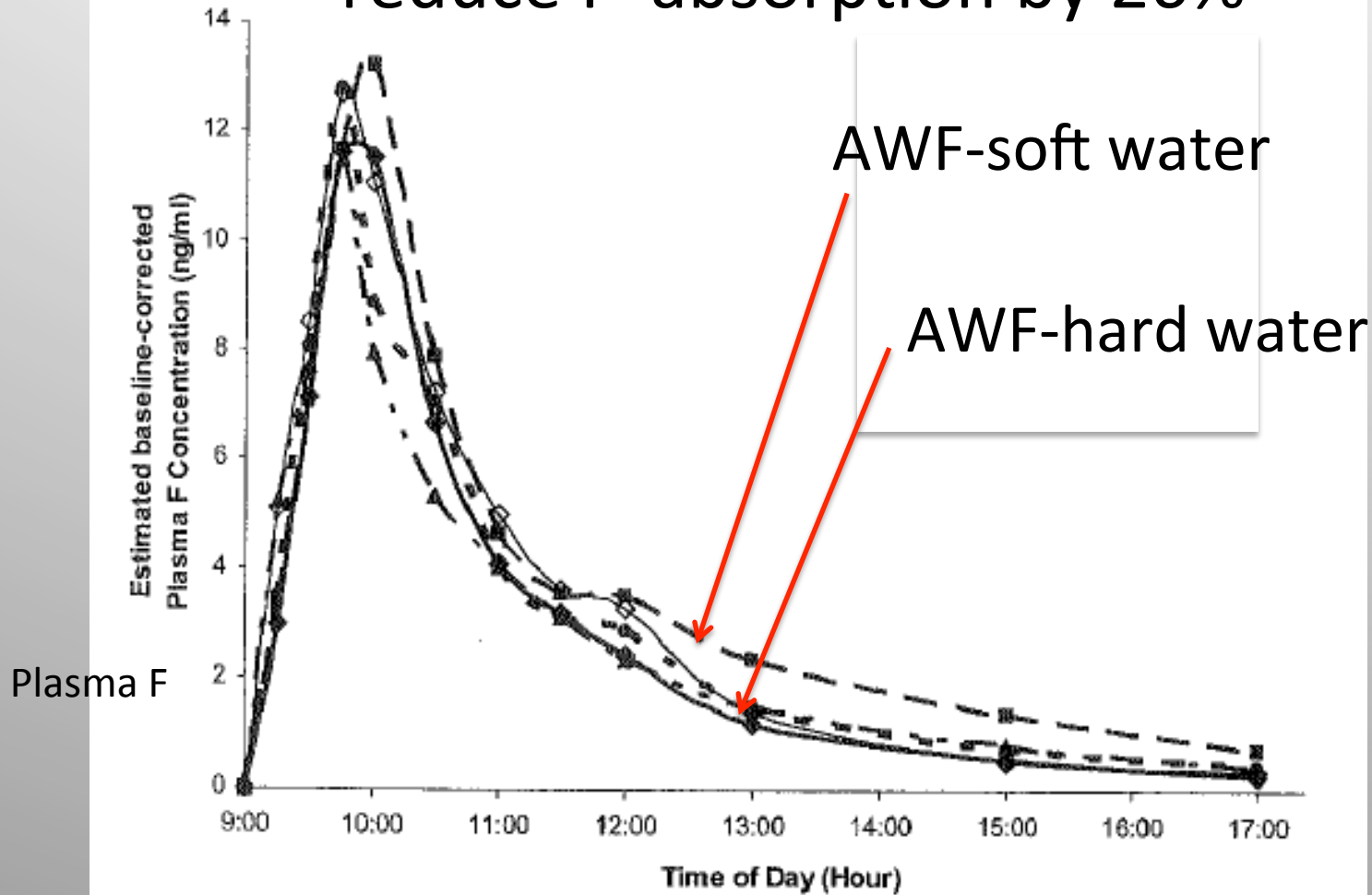


Clark DC et al. Community Dent Oral Epidemiol. 2006

Limeback H et al. Eur J Oral Sci. 2006

Ito, D. (2007) MSc Thesis

# Calcium and magnesium (hard water) reduce F<sup>-</sup> absorption by 26%



Maguire A. et al. Bioavailability of fluoride in drinking water: a human experimental study.  
*J Dent Res.* 2005 Nov;84(11):989-93.



# Canadian Dental Association Recommendation to prevent dental fluorosis

the total daily fluoride intake from all sources should not exceed 0.05-0.07 mg/kg/d

400% higher

(in order to minimize the risk of dental fluorosis)

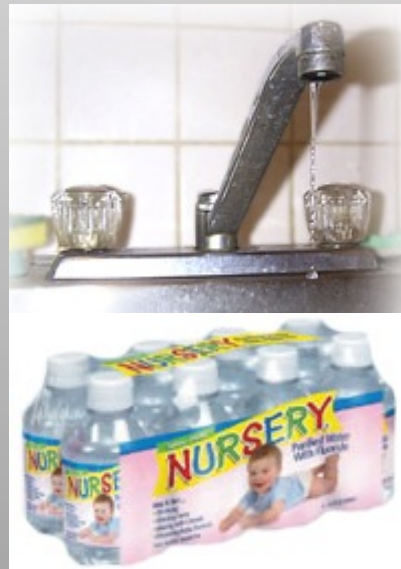
0.5 ppm

0.7 – 1.0 ppm

= 0.2 mg/kg/day



+



=

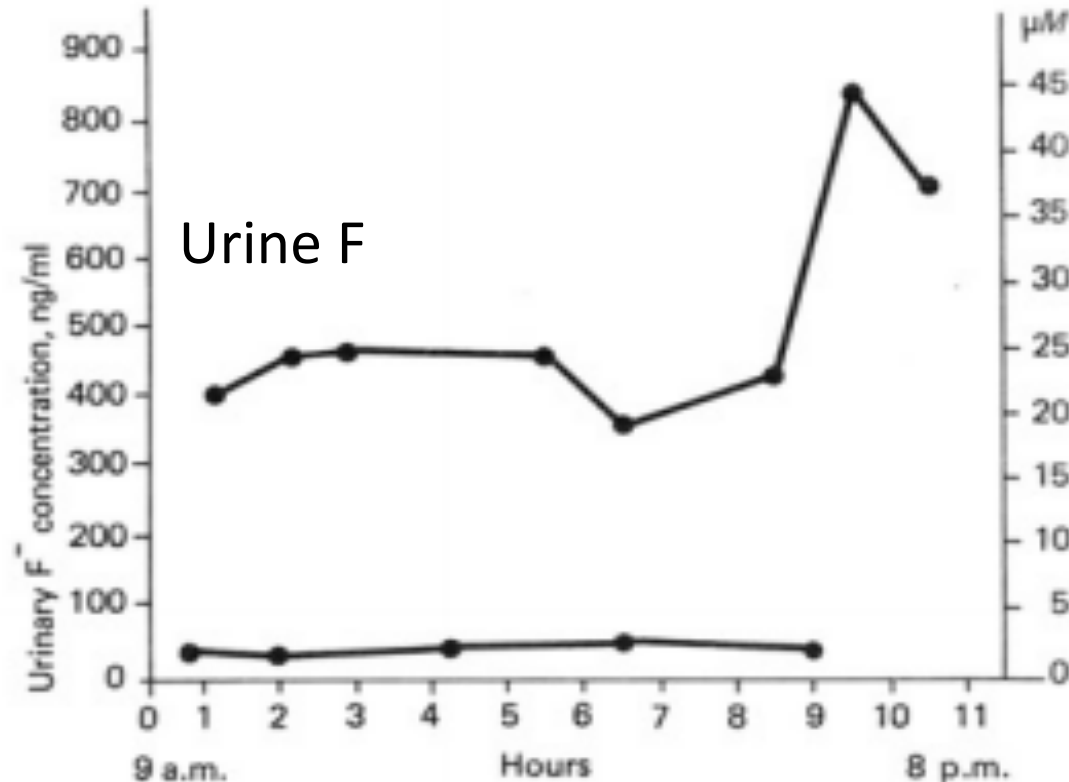


Who monitors my fluoride intake?

Clifford H, Olszowy H, Young M, Hegarty J, Cross M. Fluoride content of powdered infant formula meets Australian Food Safety Standards. Aust N Z J Public Health. 2009 Dec;33(6):573-6.

# Infant formula calcium provides no protection against fluoride in tap water

At 1 ppm, bottle fed infants have 100X higher intake of fluoride than breast fed infants

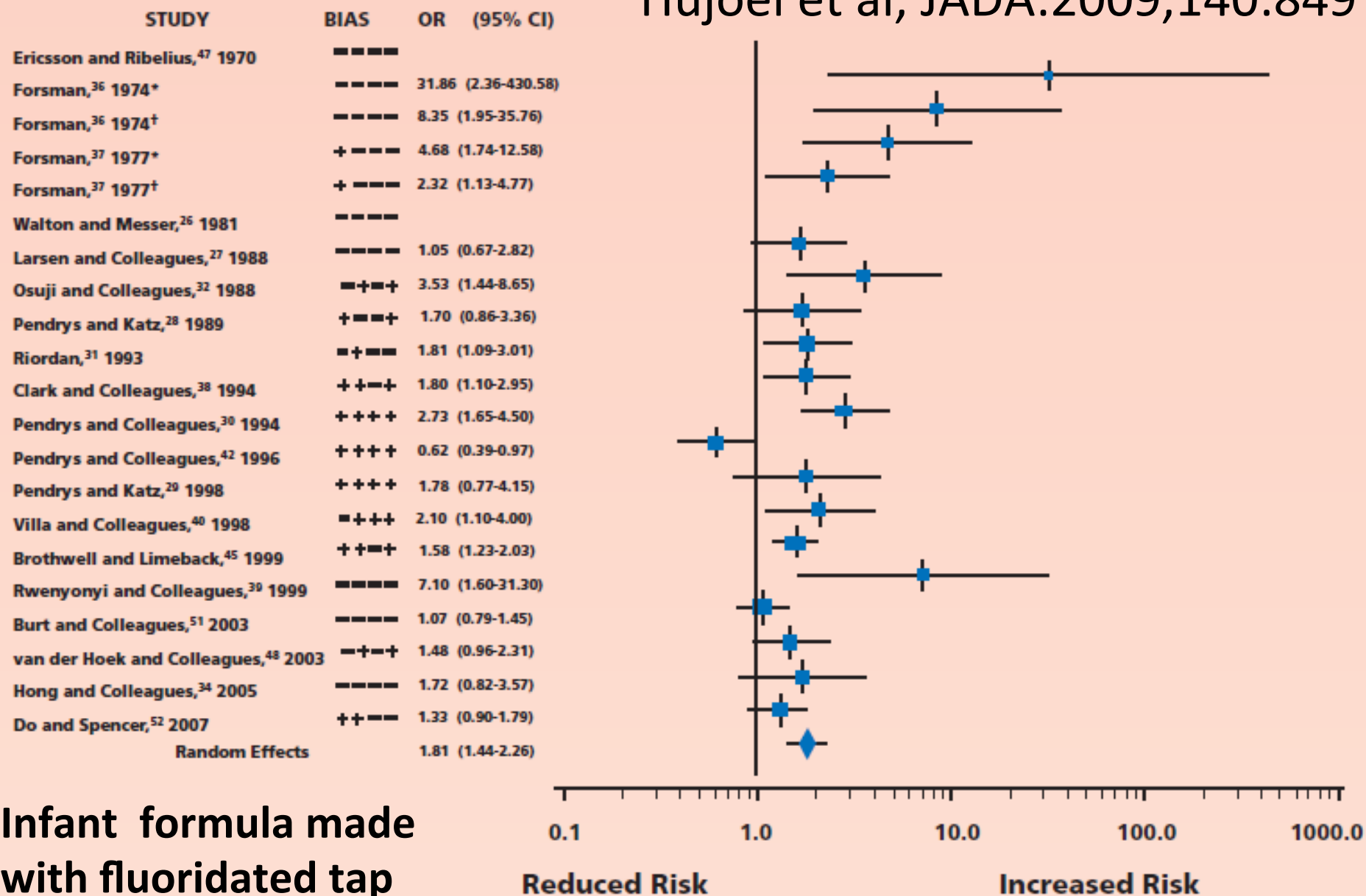


**Fig. 2.** Urine concentration of fluoride ng/ml ( $\mu M$ ) in a bottle-fed infant (upper curve) and in a breast-fed infant (same subjects as in fig. 1).

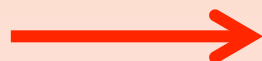
Ekstrand J, Hardell LI, Spak CJ. Fluoride balance studies on infants in a 1-ppm-water-fluoride area. *Caries Res.* 1984;18(1):87-92.

## Use of Infant Formula Versus Breast Milk or Cow's Milk

Hujoel et al, JADA:2009,140:849



Infant formula made  
with fluoridated tap  
water **INCREASES** the

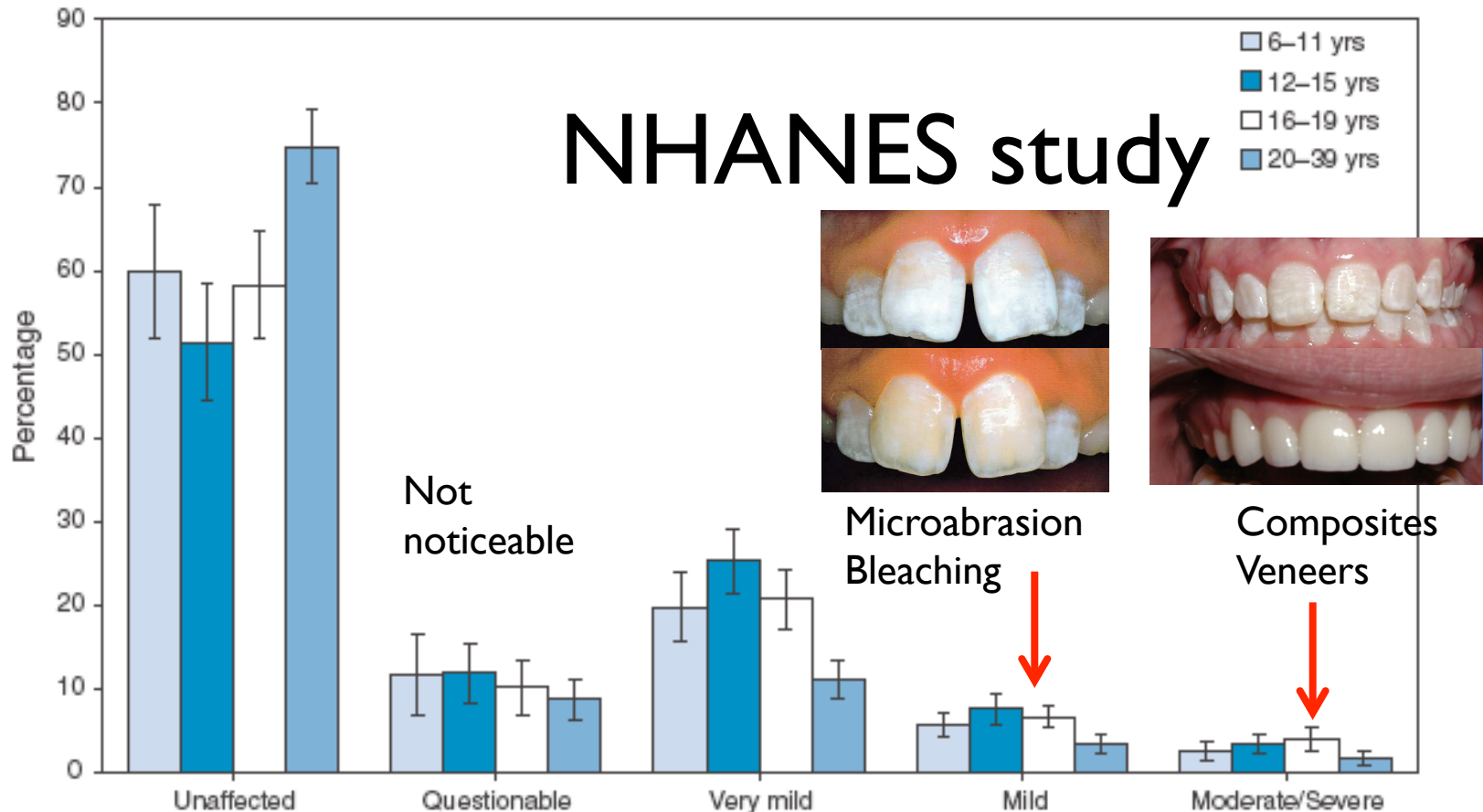


**RISK OF EXPERIENCING FLUOROSIS**

# Largest Study in the US- 10% have objectionable fluorosis

“Prevalence of enamel fluorosis has increased in cohorts born since 1980.” CDC MMWR Aug.26, 2005

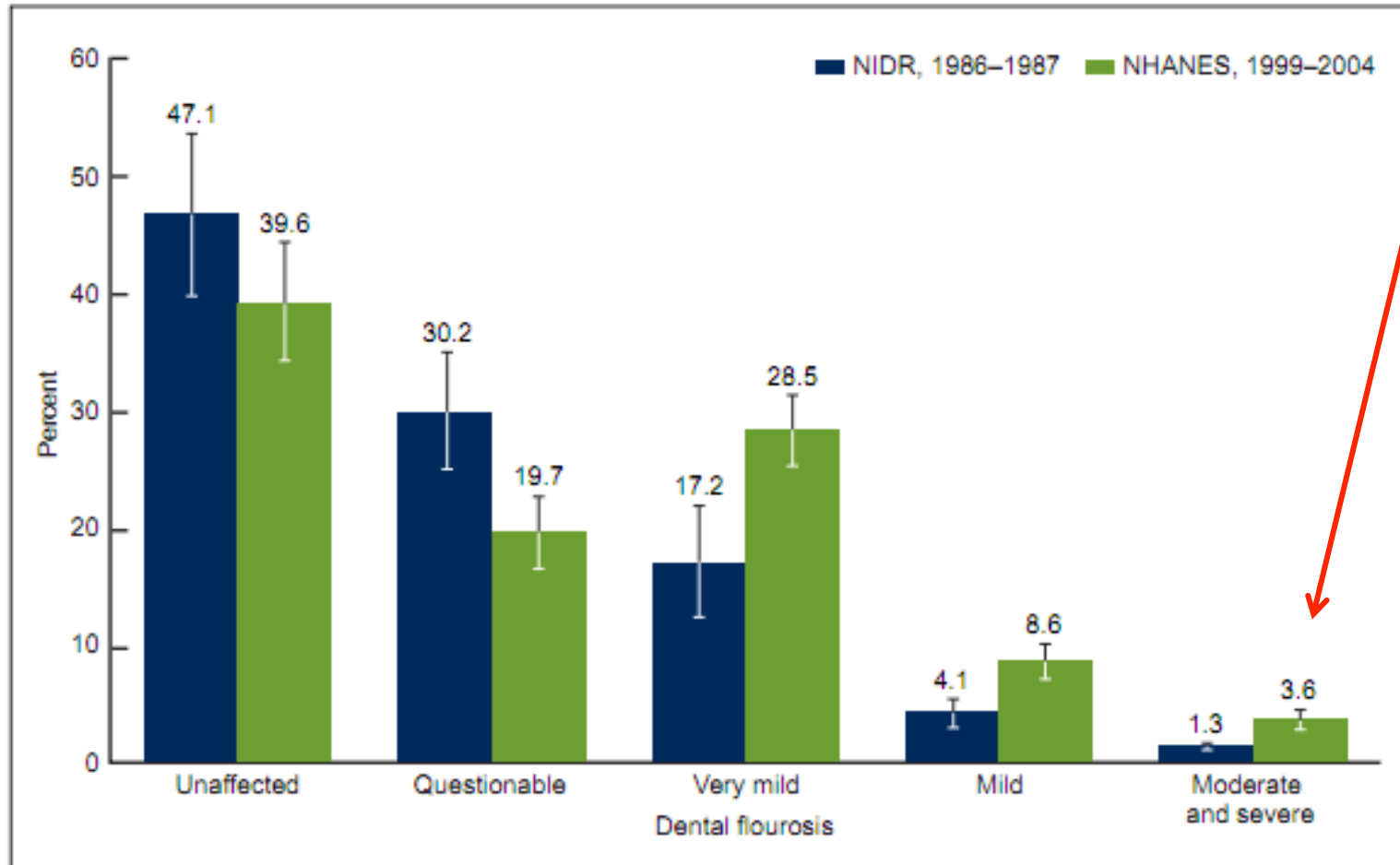
## NHANES study





# Moderate/Severe fluorosis has been increasing

Figure 3. Change in dental fluorosis prevalence among children aged 12–15 participating in two national surveys: United States, 1986–1987 and 1999–2004



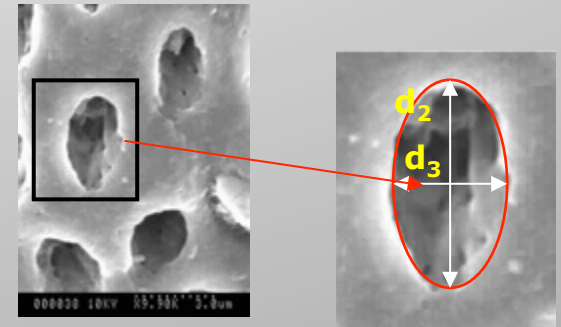
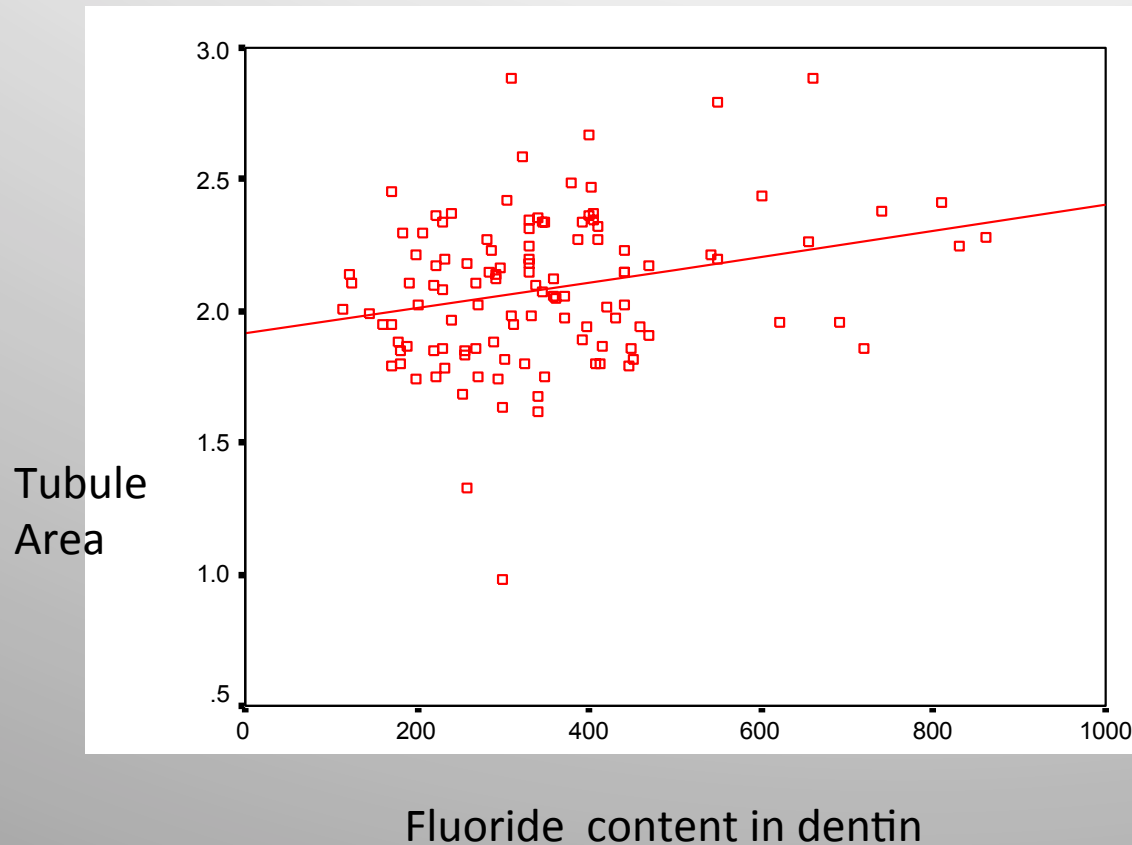
NOTES: Dental fluorosis is defined as having very mild, mild, moderate, or severe forms and is based on Dean's Fluorosis Index. Percentages do not sum to 100 due to rounding. Error bars represent 95% confidence intervals.

SOURCES: CDC/NCHS, National Health and Nutrition Examination Survey, 1999–2004 and National Institute of Dental Research, National Survey of Oral Health in U.S. School Children, 1988–1987.

“Minimal correction reduced the savings to \$3 per person per year (PPPY) for a best-case scenario, but this savings is eliminated by the estimated cost of treating dental fluorosis.”

Ko L, Thiessen K. A critique of recent economic evaluations of community water fluoridation. Internat J Occup Environ Health 2015 VOL. 21 NO. 2: 91-120.

# Fluoride affects tooth dentin tubules



Viera AP, Hancock R, Dumitriu M, Limeback H, Grynpas MD.

**Fluoride's effect on human dentin ultrasound velocity (elastic modulus) and tubule size.** *Eur J Oral Sci.* 2006 Feb;114(1):83-8.

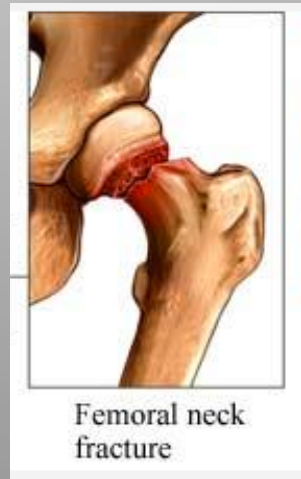
# Effect of Fluoride on Tooth Dentin

EFFECT	RESULT
<microhardness	Increased tooth fractures
-larger tubules	more rapid caries
-crystal growth disturbance	Mechanical problems and more severe caries

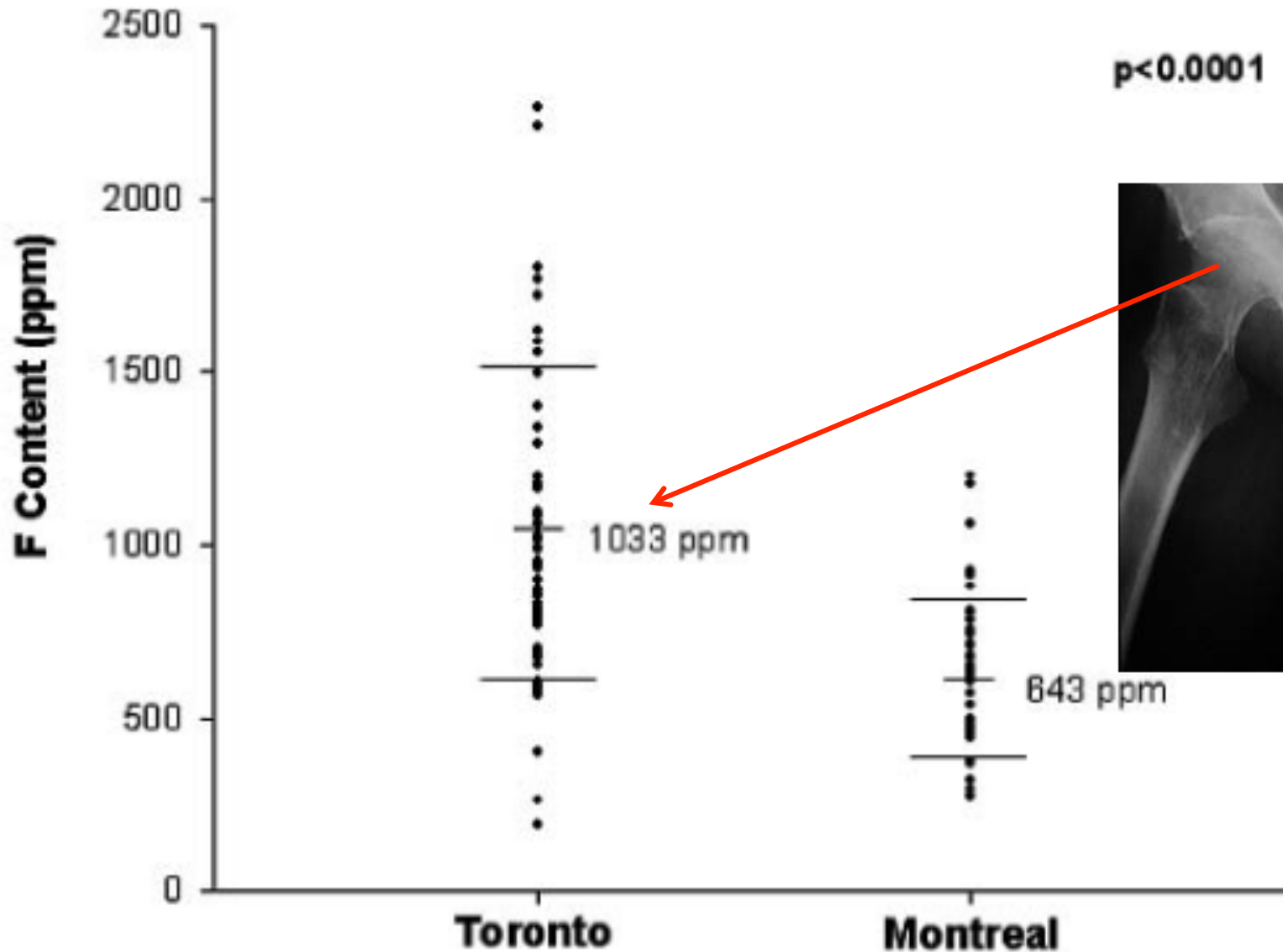


Dentmat.com

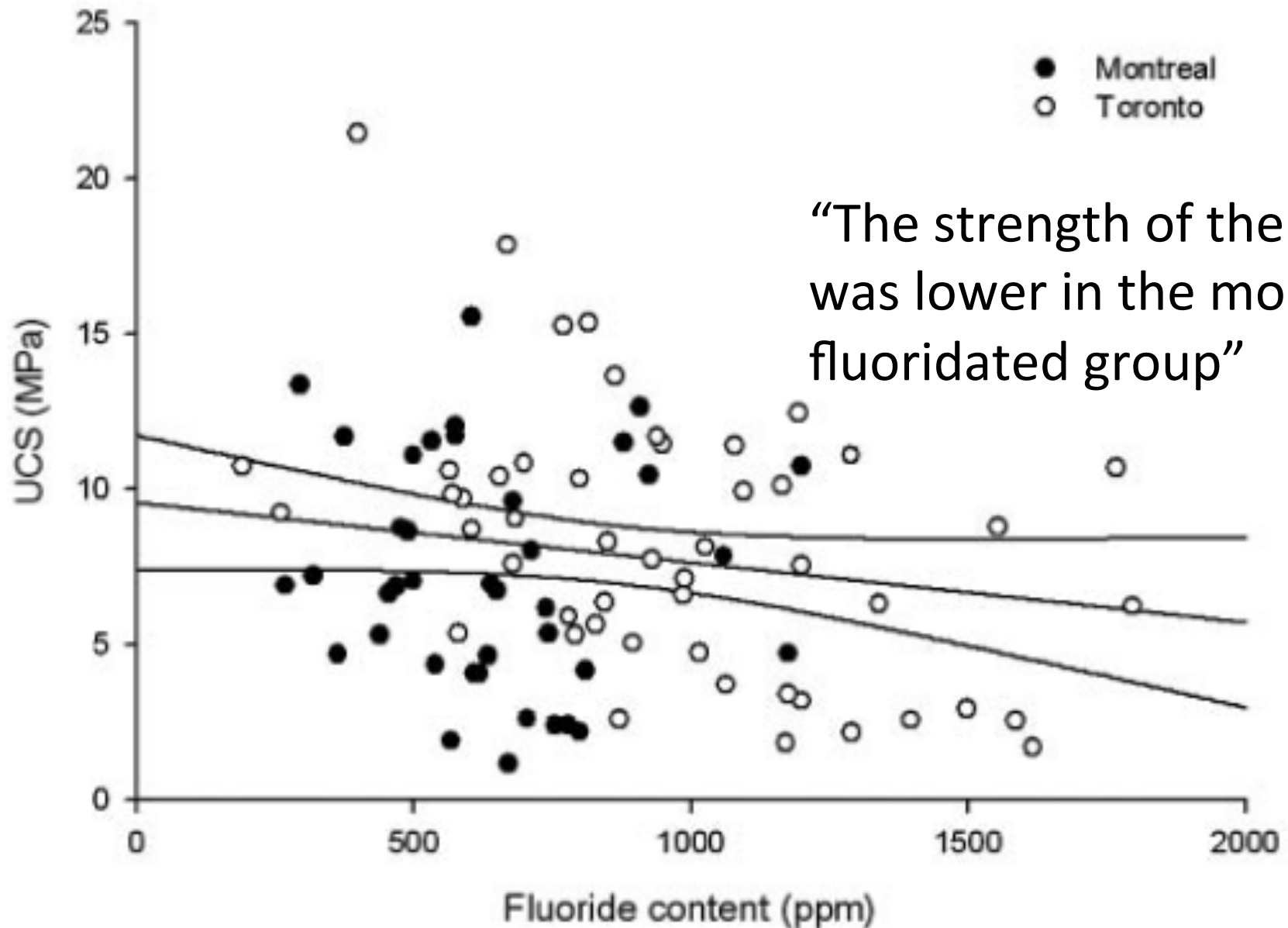
Dentin fractures are like bone fractures



# Toronto vs Montreal Bone Study

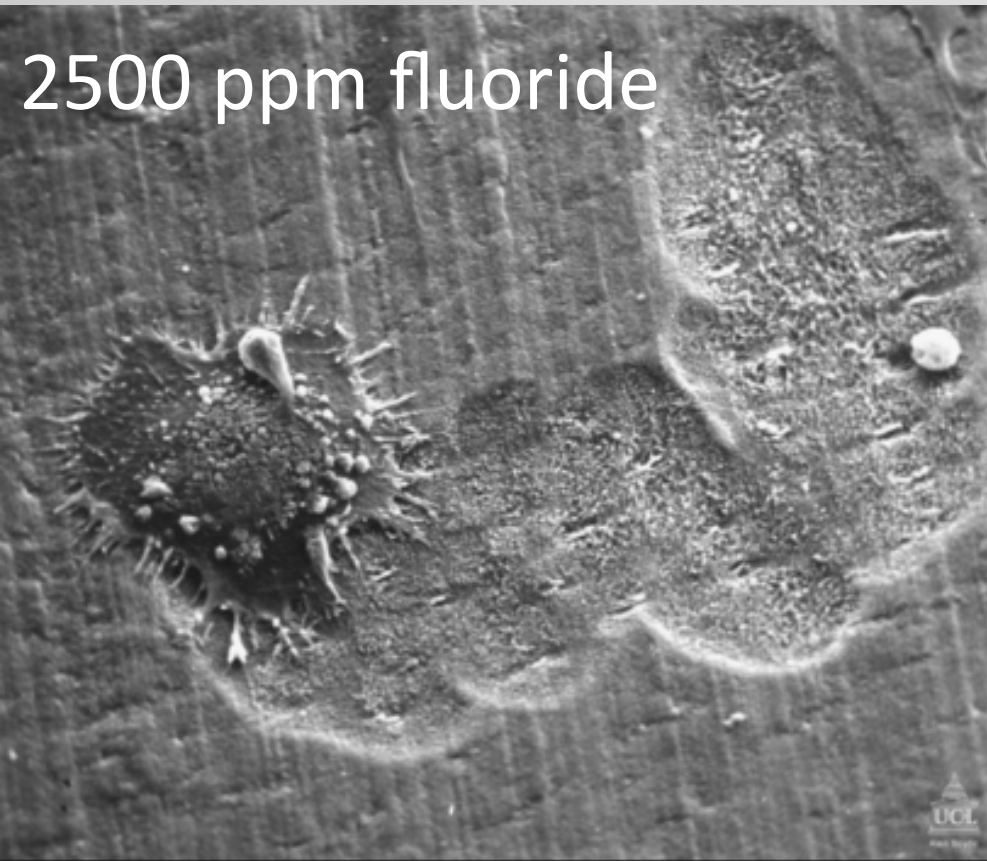


# Toronto vs Montreal Bone Study



# Effect of fluoride accumulation in bone on bone cells

## Osteoclast resorbing bone



- early bone cell death
- release of high F-  
levels to immune cells
- change in bone  
architecture

NRC Report 2006

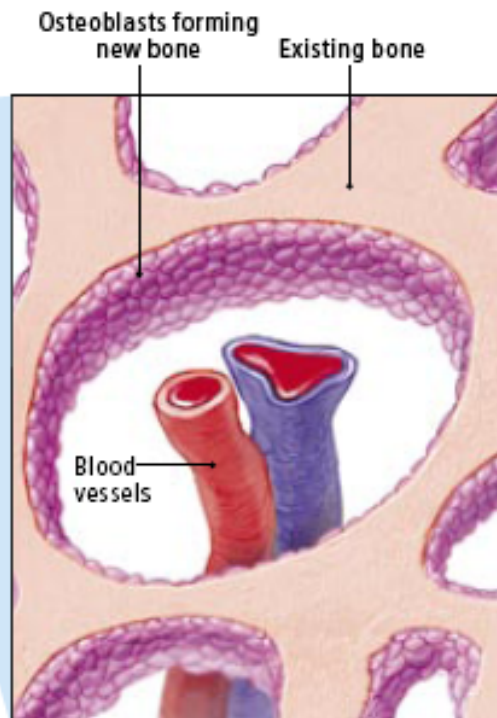
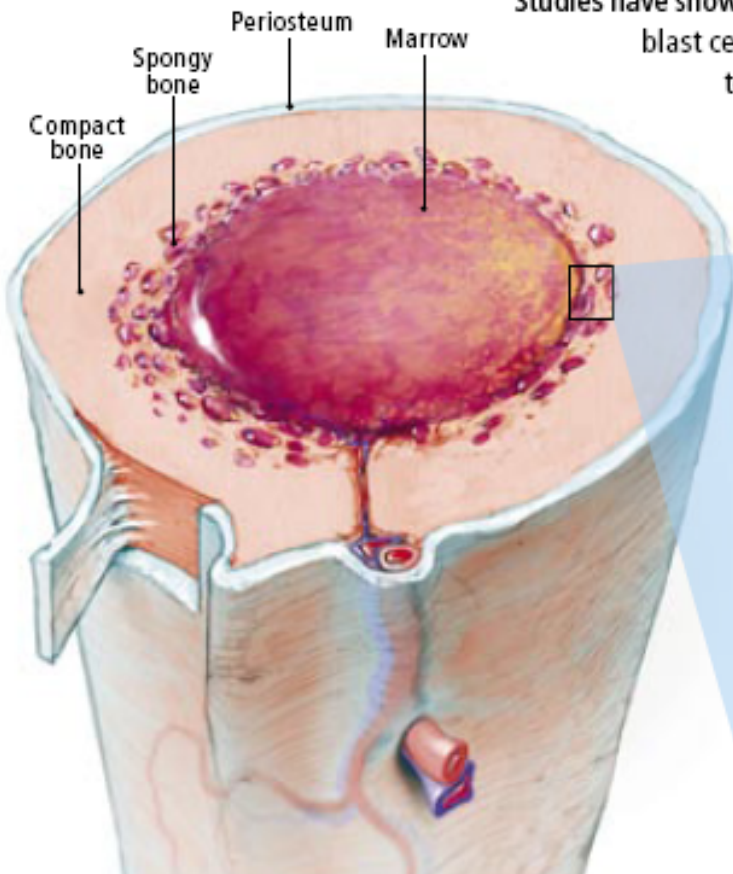


# ...may induce malignant tumours!

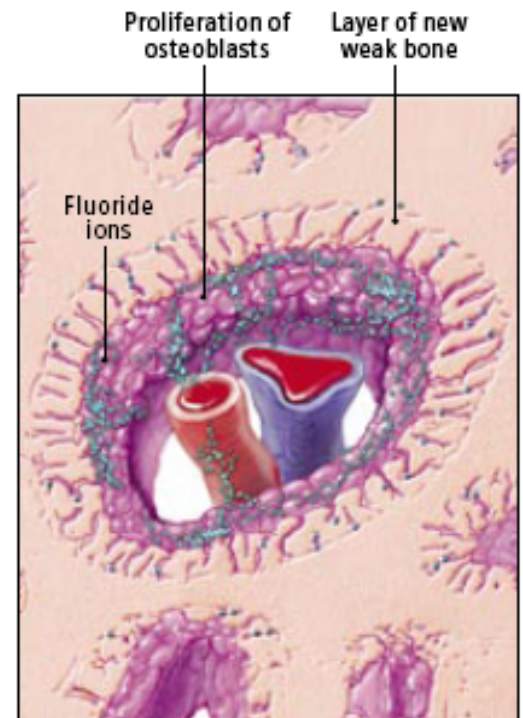
[AREA OF CONCERN]

## IS FLUORIDE WEAKENING BONE?

Scientists have focused on fluoride's effects on bone because so much of the chemical is stored there. Studies have shown that high doses of fluoride can stimulate the proliferation of bone-building osteoblast cells, raising fears that the chemical may induce malignant tumors. Fluoride also appears to alter the crystalline structure of bone, possibly increasing the risk of fractures.



▲ Normal Bone Formation



▲ Effects of Excessive Fluoride

Fagan. D. Second thoughts about fluoride. Sci Amer Jan, 2008, 74-81.



ORIGINAL PAPER

## Age-specific fluoride exposure in drinking water and osteosarcoma (United States)

Elise B. Bassin · David Wypij · Roger B. Davis ·  
Murray A. Mittleman

**546% increased risk to bone cancer !!!!**

“Our exploratory analysis found an association between fluoride exposure in drinking water during childhood and the incidence of osteosarcoma among males but not consistently among females”

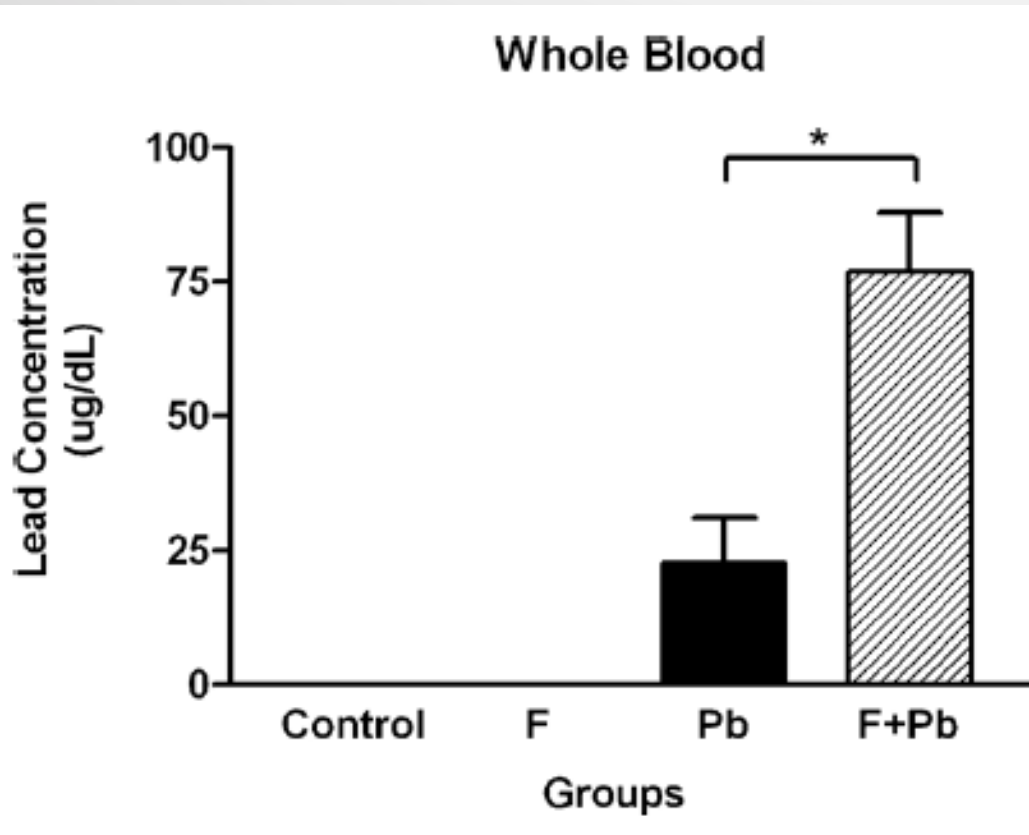


## Confirmation of and explanations for elevated blood lead and other disorders in children exposed to water disinfection and fluoridation chemicals

Myron J. Coplan<sup>a,\*</sup>, Steven C. Patch<sup>b</sup>, Roger D. Masters<sup>c</sup>, Marcia S. Bachman<sup>a</sup>

Using  $\text{H}_2\text{SiF}_6$  as a fluoridation chemical increases blood lead levels more than NaF

# ANY fluoride intake increases lead uptake



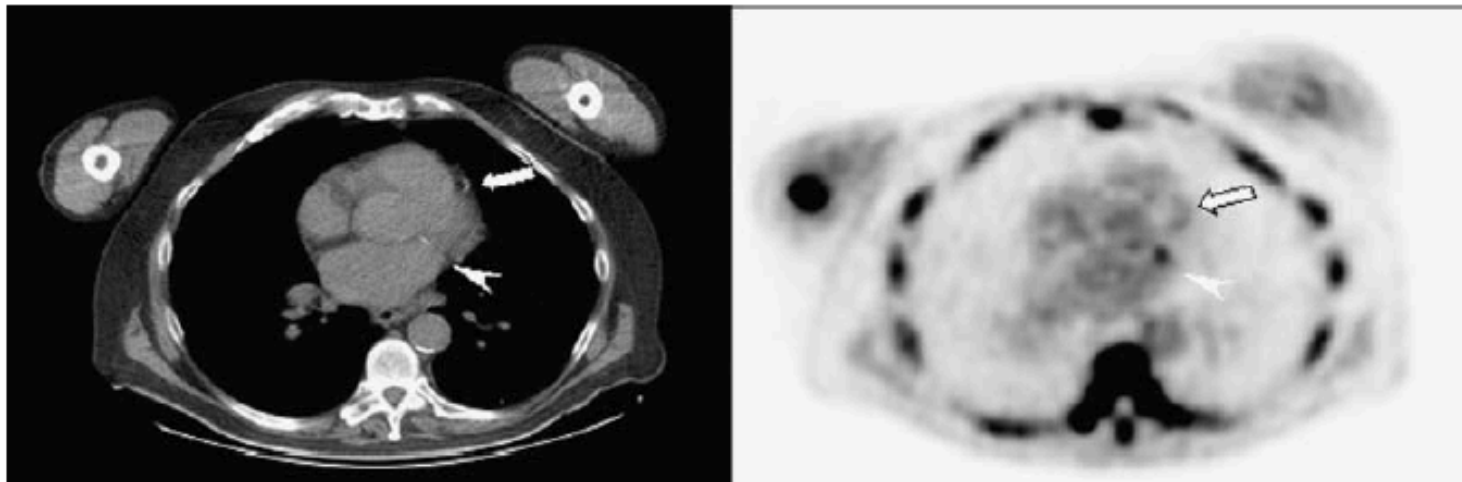
“...co-exposure to fluoride increases lead concentrations in the blood and in calcified tissues in animals exposed to lead from the beginning of gestation. These findings suggest that a biological effect not recognized so far may underlie the epidemiological association between increased BPb levels in children and water fluoridation.”

Sawan RM, Leite GA, Saraiva MC, Barbosa F Jr, Tanus-Santos JE, Gerlach RF. Fluoride increases lead concentrations in whole blood and in calcified tissues from lead-exposed rats. *Toxicology*. 2010 Apr 30;271(1-2):21-6.

## **Association of vascular fluoride uptake with vascular calcification and coronary artery disease**

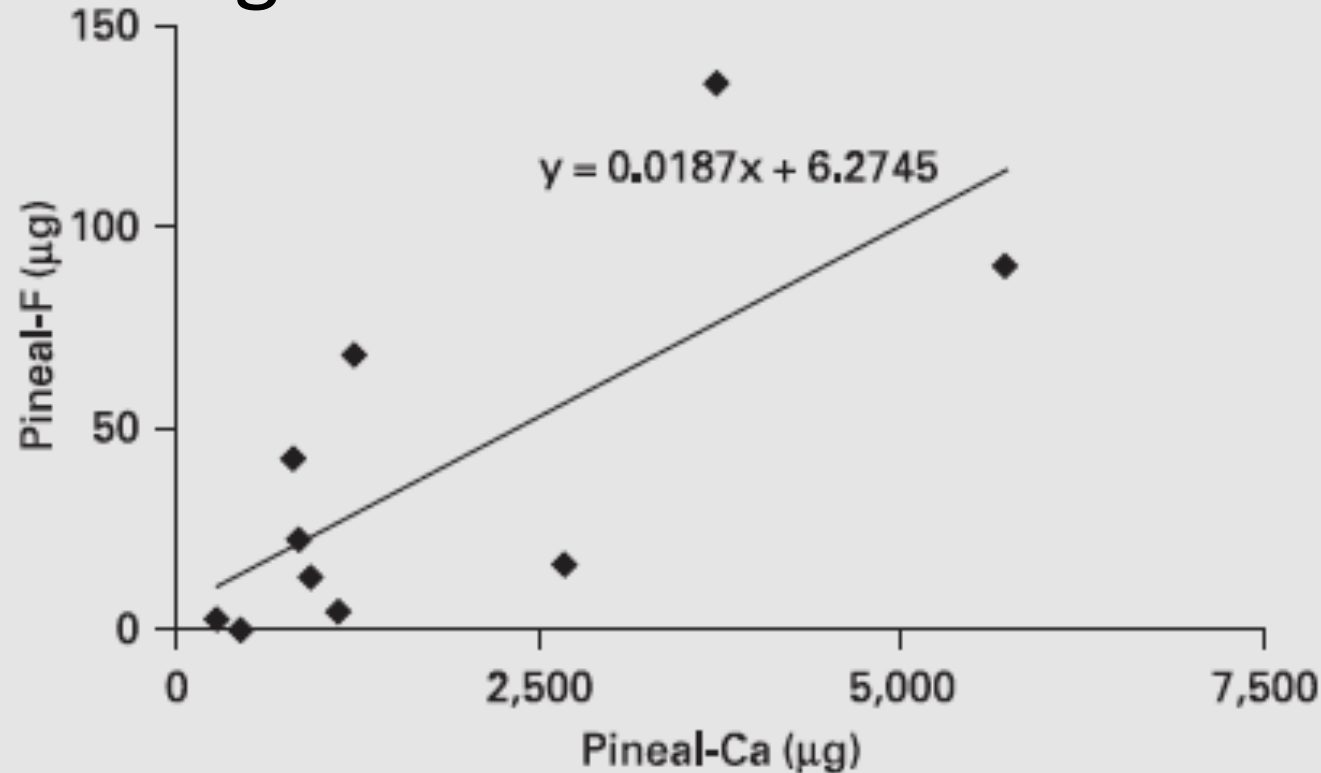
Yuxin Li<sup>a</sup>, Gholam R. Berenji<sup>a</sup>, Wisam F. Shaba<sup>a</sup>, Bashir Tafti<sup>a</sup>, Ella Yevdayev<sup>a</sup>  
and Simin Dadparvar<sup>b</sup> Nuclear Medicine Communications 2012, 33:14–20

# Fluoride accumulates in coronary arteries where they are calcifying



Computed tomography (left) and positron emission tomography (right) images show coronary calcification and fluoride uptake in the left anterior descending coronary artery (arrow) and the circumflex coronary artery (arrow head).

# Fluoride accumulates in human pineal glands and lowers melatonin



**Fig. 1.** The relationship between the calcium and fluoride contents of ten aged human pineal glands.

Fluoride from water fluoridation  
accumulates over a lifetime in:

- **Bones** (making them more brittle and increasing lead uptake)
- **Teeth** (decreasing strength and increasing dentin caries)
- **Calcifying atherosclerotic plaque**  
(increasing the risk for heart attacks and stroke)
- **Pineal glands** (lowering melatonin)

# Conclusions

- AWF toxicity is well supported by science
- Because of these 'ugly facts' as outlined, 'Safe and Effective' claim for artificial water fluoridation must be altered or completely abandoned