



Response to Claims of Pamela Hughes, DO

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April 5, 2016

1. Hughes: *"The Center for Disease Control and Prevention (CDC, 1999, 2001) has acknowledged that the mechanism that provides fluoride benefit is topical, not systemic"*

Facts:

A. The CDC has made no such acknowledgement. The CDC has stated in the past that the effects of fluoride are *predominantly* topical, but not that they were *only* topical.

B. In actuality, the effects of fluoride are both topical and systemic. The systemic effects are demonstrated in the mild to very mild dental fluorosis which is the only dental fluorosis in any manner associated with optimally fluoridated water. Mild to very mild dental fluorosis is a barely detectable effect which causes no adverse effect on cosmetics, form, function, or health of teeth. As Kumar, et al. have demonstrated mildly fluorosed teeth to be more decay resistant, many consider this effect to not even be undesirable, much less adverse. Dental fluorosis can only occur systemically.

—The Association Between Enamel Fluorosis and Dental Caries in U.S. Schoolchildren Hiroko Iida, DDS, MPH and Jayanth V. Kumar, DDS, MPH
<http://jada.ada.org/content/140/7/855.long>

Additionally, saliva with fluoride incorporated into it provides a constant bathing of the teeth in a low concentration of fluoride all throughout the day, a very effective means of dental decay prevention. Incorporation of fluoride into saliva occurs systemically.

From the CDC:

"Fluoride works to control early dental caries in several ways. Fluoride concentrated in plaque and saliva inhibits the demineralization of sound enamel and enhances the remineralization (i.e., recovery) of demineralized enamel. As cariogenic bacteria metabolize carbohydrates and produce acid, fluoride is released from dental plaque in response to lowered pH at the tooth-plaque interface. The released fluoride and the fluoride present in saliva are then taken up, along with calcium and phosphate, by de-mineralized enamel to establish an improved enamel crystal structure. This improved structure is more acid resistant and contains more fluoride and

less carbonate.. Fluoride is more readily taken up by demineralized enamel than by sound enamel.. Cycles of demineralization and remineralization continue throughout the lifetime of the tooth."

-----Recommendations for Using Fluoride to Prevent and Control Dental Caries in the United States

United States Centers for Disease Control
Recommendations and Reports
August 17, 2001/50(RR14);1-42

Additionally, in a 2014 study Cho, et al. found:

"Conclusions: While 6-year-old children who had not ingested fluoridated water showed higher dft in theWF-ceased area than in the non-WF area, 11-year-old children in theWF-ceased area who had ingested fluoridated water for approximately 4 years after birth showed significantly lower DMFT than those in the non-WF area. This suggests that the systemic effect of fluoride intake through water fluoridation could be important for the prevention of dental caries."

-----Systemic effect of water fluoridation on dental caries prevalence

Cho HJ, Jin BH, Park DY, Jung SH, Lee HS, Paik DI, Bae KH.

Community Dent Oral Epidemiol 2014; 42: 341–348. © 2014 John Wiley & Sons A/S. Published by John Wiley & Sons Ltd

Additionally:

“Evidence also supports fluoride’s systemic mechanism of caries inhibition in pit and fissure surfaces of permanent first molars when it is incorporated into these teeth pre-eruptively.”

---Buzalaf MAR (ed): Fluoride and the Oral Environment. Monogr Oral Sci. Basel, Karger, 2011, vol 22, pp 97–114
(DOI:10.1159/000325151)

2. Hughes: Since the benefit is topical and the risks are systemic, it makes more sense to allow people to choose to use fluoride topically in their toothpaste rather than ingesting synthetic fluoride placed in the water.

Facts:

A. As demonstrated in item #1, the effects of fluoride are both topical and systemic.

B. There is no valid, peer-reviewed scientific evidence of any “risks” of optimal level fluoride, systemic or otherwise. Peer-reviewed evidence can be provided which clearly debunks the usual studies provided by fluoridation opponents, i.e. Peckham, Malin, “Harvard IQ study”, and others.

C. Topical applications of high concentrations of fluoride such as in toothpaste are certainly advantageous, however, these one shot exposures are not a replacement for the very effective bathing of the teeth in a low concentration of fluoride all during the day, as provided by water fluoridation. These measures are best in conjunction with each other, not in place of one or the other.

D. There is no such thing as “synthetic fluoride”. Fluoride is the anion of the naturally occurring element fluorine. An anion is a negatively charged atom. There are no synthetic atoms of fluorine. The fluoride ions added to water through fluoridation are identical to those which have always existed in water. A fluoride ion is a fluoride ion, regardless the source compound from which they are released into water.

As groundwater flows over rocks, it picks up fluoride ions which have been leached from the compound calcium fluoride and fluorosilicate compounds in those rocks. These fluoride ions are to what is commonly referred as being “naturally occurring” fluoride.

The substance most widely utilized to add fluoride ions to water during fluoridation is the compound hydrofluorosilic acid (HFA). Once introduced into drinking water, due to the pH of that water (~7), the HFA is immediately and completely hydrolyzed (dissociated). The products of this hydrolysis are fluoride ions identical to those which have always existed in water, and trace contaminants in barely detectable amounts far below EPA mandated maximum allowable levels of safety. After this point, HFA no longer exists in that water. It does not reach the tap. It is not ingested.

---Reexamination of Hexafluorosilicate Hydrolysis By F NMR and pH Measurement
William F. Finney, Erin Wilson, Andrew Callender, Michael D. Morris, and Larry W. Beck
Environmental Science and Technology/ Vol 40, No. 8, 2006

3. Hughes: “In 2010 the CDC reported that 41% of American adolescents had dental fluorosis (Beltran-Aguilar 2010). This is not an acceptable rate of complications by any standard, and forces the question of benefit over risk.”

Facts:

A. The mild to very mild dental fluorosis which may be attributable to optimally fluoridated water is not a “complication”, it is a barely detectable cosmetic effect which is viewed by most who are even aware that they have dental fluorosis as either a positive, or neutral.

“Conclusion: Very mild and mild dental fluorosis diminished with time. Dental fluorosis did not have a negative impact on perceptions of oral health. “

— —Natural history and long-term impact of dental fluorosis: a prospective cohort study
Loc G Do, Diep H Ha and A John Spencer
Med J Aust 2016; 204 (1): 25.

“A child's caries experience negatively affects OHRQoL [Oral Health-related Quality of Life], while fluorosis has little impact.”

— — J Dent Res. 2014 Oct;93(10):972-9. doi: 10.1177/0022034514548705. Epub 2014 Aug 25.
Effects of enamel fluorosis and dental caries on quality of life.
Onoriobe U1, Rozier RG2, Cantrell J3, King RS4.

B. Beltran-Aguilar reported that 41% of adolescents they examined in the study were found to have signs of dental fluorosis. This 41% was composed of 37.1% with mild to very mild dental fluorosis, both of which are barely detectable, benign effects requiring no treatment, and which have no effect on cosmetics, form, function, or health of teeth....with the other 3.8% being those with moderate dental fluorosis, attributable to improper ingestion of toothpaste and/or exposure to abnormally high levels of environmental or well-water fluoride during the teeth forming years of 0-8. The amount of severe dental fluorosis was negligible.

— — Prevalence and Severity of Dental Fluorosis in the United States, 1999-2004
Eugenio D. Beltrán-Aguilar, D.M.D., M.S., Dr.P.H.; Laurie Barker, M.S.P.H.; and Bruce A. Dye, D.D.S., M.P.H.

The hypocrisy of fluoridation opponents is clearly evident by their lamenting concern about benign, barely detectable mild dental fluorosis while callously ignoring the lifetimes of extreme pain, debilitation, development of serious medical conditions, loss of teeth, and life-threatening infection directly resultant of untreated dental decay which could be, and is, prevented by water fluoridation.

4. Hughes: *“Finally, the largest survey ever done in the US on over 39,000 children from over 84 communities showed little difference in tooth decay among children in fluoridated and non-fluoridated communities (Hileman, 1989).”*

Facts:

A. Hillman, 1989 is simply an editorial which reports the interpretations of the 1988 NIDR survey data by long time fluoridation opponent, fringe activist, John Yiamouyiannis. Hughes misrepresents here by stating what she claims the NIDR survey “showed”. What she is actually quoting, however, is Yiamouyiannis’ skewed interpretation of that NIDR data.

B. The Brunelle and Carlos NIDR study is routinely read superficially by folks eager to discount fluoridation.

“The paper [Brunelle/Carlos] can be quoted as averages to minimize the effect because the 0.6 surface is the effect averaged over both age and geography. 5 year olds have only 1 or two permanent teeth and there is essentially no difference between cavity rates at that early age yet they are counted in calculating the "average"”

By age 17 the difference between fluoridated and non-fluoridated is about 1.6 surfaces and the benefit curve is sharply accelerating with a benefit just under 3 times higher than the 0.6 so commonly quoted.

—Int J Occup Environ Health. 2005 Jul-Sep;11(3):322-6. Scientific evidence continues to support fluoridation of public water supplies. Pollick HF.

Also, in areas where fluoridation is common the Halo effect minimizes the differences between the two types of water systems. Thus the average results actually hide both the Halo Effect and the remarkable differences between communities where fluoridation is uncommon.

From the abstract of Brunelle/Carlos:

“The decline in dental caries in U.S. schoolchildren, first observed nationwide in 1979-1980, was confirmed further by a second national epidemiological survey completed in 1987. Mean DMFS scores in persons aged 5-17 years had decreased about 36% during the interval, and, in 1987, approximately 50% of children were caries-free in the permanent dentition. Children who had always been exposed to community water fluoridation had mean DMFS scores about 18% lower than those who had never lived in fluoridated communities. When some of the "background" effect of topical fluoride was controlled, this difference increased to 25%. The results suggest that water fluoridation has played a dominant role in the decline in caries and must continue to be a major prevention methodology.”

-----Recent trends in dental caries in U.S. children and the effect of water fluoridation.

Brunelle JA1, Carlos JP.

J Dent Res. 1990 Feb;69 Spec No:723-7; discussion 820-3.

5. Hughes: *“The community is informed that fluoride is being placed in water systems to ‘help prevent cavities’.”*

Facts:

The level of existing fluoride in drinking water is, indeed, adjusted to the optimal level in order to prevent dental decay in entire populations.....which countless peer-reviewed scientific studies clearly demonstrate that it does. A list of some of these studies can be found at the end of this document.

6. Hughes: *“Fluoride is not a nutrient or a supplement as it is often labeled.*

Facts:

A. Fluoride is indeed a nutrient.

"This report focuses on five nutrients—calcium, phosphorus, magnesium, vitamin D, and fluoride, all of which play a key role in the development and maintenance of bone and other calcified tissues."

---Institute of Medicine (US) Standing Committee on the Scientific Evaluation of Dietary Reference Intakes. Dietary Reference Intakes for Calcium, Phosphorus, Magnesium, Vitamin D, and Fluoride. Washington (DC): National Academies Press (US); 1997. Preface.

"Fluoride is regarded as an essential nutrient now well known to be effective in the maintenance of a tooth enamel that is more resistant to decay."

---Fluoride as a Nutrient
American Academy of Pediatrics
Committee on Nutrition
Pediatrics, vol. 49, No 3, March 1972

"Fluoride is a normal constituent of the human body, involved in the mineralisation of both teeth and bones (Fairley et al 1983, Varughese & Moreno 1981). The fluoride concentration in bones and teeth is about 10,000 times that in body fluids and soft tissues (Bergmann & Bergmann 1991, 1995). Nearly 99% of the body's fluoride is bound strongly to calcified tissues. Fluoride in bone appears to exist in both rapidly- and slowly-exchangeable pools. Because of its role in the prevention of dental caries, fluoride has been classified as essential to human health (Bergmann & Bergmann 1991, FNB:IOM 1997)8"

-----Australian Government
National Health and Medical Research Council
<https://www.nrv.gov.au/nutrients/fluoride>

B. Fluoride is indeed a supplement:

"Dietary fluoride supplements in the form of tablets, lozenges, or liquids (including fluoride-vitamin preparations) have been used throughout the world since the 1940s. Most supplements contain sodium fluoride as the active ingredient. Tablets and lozenges are manufactured with 1.0, 0.5, or 0.25 mg fluoride. To maximize the topical effect of fluoride, tablets and lozenges are intended to be chewed or sucked for 1--2 minutes before being swallowed. For infants, supplements are available as a liquid and used with a dropper."

---Recommendations for Using Fluoride to Prevent and Control Dental Caries in the United States
US Centers for Disease Control and Prevention
MMWR
Recommendations and Reports August 17, 2001 / 50(RR14);1-42

7. *Hughes: "By FDA standards, the use of fluoride in the water is the equivalent of placing a drug into the water to prevent disease.*

Facts:

A. This unsubstantiated statement by Hughes is irrelevant. The FDA has no jurisdiction over the contents of drinking water, certainly including minerals such as fluoride. This jurisdiction falls entirely under the US Environmental Protection Agency. Purported "FDA standards" are no

more relevant to optimally fluoridated water than would be the standards of the FBI, the CIA, or NASA. They are all irrelevant.

B. There are no drugs involved in fluoridation. There are simply fluoride ions, identical to those which always have and always will exist in water, fluoridated or not. Fluoridation does nothing but ensure that we receive maximum benefit from a mineral which we ingest in our water, while strictly maintaining the level of that mineral well below the threshold of adverse effects. Cessation of fluoridation does not cease ingestion of fluoride, it simply eliminates the benefit obtained while so doing, and the strict controls which maintain the level of fluoride at a consistent, safe level.

8. Hughes: "When a patient is offered a treatment to prevent disease the risks and benefits are reviewed."

Facts:

A. There is no "treatment" involved in water fluoridation. There is simply the adjustment of the level of an existing mineral in water such that maximum benefit will be obtained while ingesting it in our water.....while maintaining the level of that mineral well below the threshold of adverse effects.

B. There is no valid, peer-reviewed scientific evidence of any "risks" of adverse effects from optimally fluoridated water. In the 71 year history of this initiative, hundreds of millions having ingested fluoridated water during this time period, there have been no proven adverse effects.

9. Hughes: "Allowing a government to impose this drug onto an entire community is tantamount to a physician prescribing a drug to a patient without the patient's consent. Being straightforward, it's unethical."

Facts:

A. Nothing is imposed upon anyone in regard to water fluoridation. People are entirely free to drink the water or not. Their choice.

B. A physician does not need a patient's consent in order to prescribe a drug. The physician needs the patient's consent in order to administer the drug to the patient. Local officials do not require any individual's consent in order to approve the concentration level of mineral within public water systems under their jurisdiction. Anyone who deems they need consent prior to drinking a glass of water is entirely free to give or not give such consent to themselves prior to "administrating" that glass of water to themselves.

C. That which is "unethical" is the attempts by fluoridation opponents to deprive entire populations of the benefits of a very valuable public health initiative based on nothing but false statements, unsubstantiated claims, misrepresented science, and misinformation.

10. Hughes: "Once the fluoride is in the water there is no way to control the dose each individual receives. This is of large concern given the variable amount of water each person drinks and the amount that would be toxic would be variable from person to person."

Facts:

A. Dose is not an issue of any concern in regard to water fluoridated at the optimal level.

Simply put, water is fluoridated at 0.7 mg/liter (ppm=mg/liter). Thus, for every liter of fluoridated water consumed, the "dose" of fluoride intake is 0.7 mg. The average daily water consumption by an adult is 2-3 liters per day. The US CDC estimates that of the total daily intake, or "dose", of fluoride from all sources including dental products, 75% is from the water.

The US Institute of Medicine has established that the daily upper limit for fluoride intake from all sources, for adults, before adverse effects will occur, short or long term, is 10 mg. As can be noted from a simple math equation, before the daily upper limit of fluoride intake could be attained in association with optimally fluoridated water, water toxicity would be the concern, not fluoride. Even an excessive water drinker would be in no danger of adverse effects from optimally fluoridated water.

The range of safety between the miniscule few parts per million fluoride that are added to existing fluoride levels in fluoridated water, is so wide that "dose" is not an issue.

<http://iom.edu/Activities/Nutrition/SummaryDRIs/~//media/Files/Activity%20Files/Nutrition/DRIs/ULs%20for%20Vitamins%20and%20Elements.pdf>

B. Where dose could indeed be “of large concern given the variable amount of water each person drinks and the amount that would be toxic would be variable from person to person” is in non-fluoridated water systems which are bound only by the EPA maximum allowable level of 4.0 mg/liter. Cessation of fluoridation removes the strict controls which maintain the level of fluoride in drinking water at the optimal level of 0.7 mg/liter.

11. Hughes: “It is known that fluoride displaces iodine, which is the key mineral that your thyroid uses to form thyroid hormone, which can lead to hypothyroidism. “

Facts:

A. There is no valid, peer-reviewed scientific evidence of any adverse effect on the thyroid from optimal level fluoride, the widely discredited Peckham study notwithstanding.

The 2006 NRC Committee listed but three concerns with fluoride at the level of 4.0 ppm and below: severe dental fluorosis, bone fracture, and skeletal fluorosis with chronic consumption of water with a fluoride level of 4.0 ppm or greater. If this committee had any concerns with adverse effects of fluoride at the level of 4.0 ppm or below, on the thyroid, it would have been responsible for so stating and recommending accordingly. It did not.

—Fluoride in Drinking Water: A Scientific Review of EPA's Standards
Committee on Fluoride in Drinking Water, National Research Council 2005

B. From a highly respected endocrinologist at the University of Florida:

April 27, 2013

“As a practicing endocrinologist, I was appalled at the claims that fluoridated drinking water causes clinically significant harm to the endocrine system.”

“Clinically, in more than 30 years of seeing patients, I have never seen any fractures or thyroid problems associated with fluoridated water. Early puberty is more associated with obesity than anything else, though there are many endocrine disrupters that have estrogenic effect. Fluoride has not been implicated, though lavender, tea tree oil and HCG, substances found commonly in hair products, have been.”

“I looked at the papers cited about the effects of fluoride on thyroid function and could find none that suggested any effect on thyroid at doses used in fluoridated water. A Review of the literature published in 1986 came to the same conclusion”

Janet Silverstein, MD, FAAP
University of Florida Physicians

C. [BRITISH FLUORIDATION SOCIETY STATEMENT \(January 2006\) on the absence of an association between water fluoridation and thyroid disorders.](#)

[This statement has been reviewed and endorsed by the British Thyroid Association (BTA); however, the BTA would recommend that appropriate monitoring of thyroid status should be considered in areas where fluoridation is introduced to enable an ongoing epidemiological evidence base for thyroid status with fluoridation to be created.]

The available medical and scientific evidence suggests an absence of an association between water fluoridation and thyroid disorders.

Many major reviews of the relevant scientific literature around the world support this conclusion.

Of particular importance are:

- an exhaustive review conducted in 1976 by an expert scientific committee of the Royal College of Physicians of England;
- a systematic review in 2000 by the NHS Centre for Reviews and Dissemination at the University of York; and,
- a 2002 review by an international group of experts for the International Programme on Chemical Safety (IPCS), under the joint sponsorship of the World Health Organisation (WHO), the United Nations Environment Programme (UNEP), and the International Labour Organisation (ILO).

None has found any credible evidence of an association between water fluoridation and any disorder of the thyroid.

Report of Royal College of Physicians

A scientific committee was established by the Royal College of Physicians to review whether, and to what extent, water fluoridation benefited people's teeth and whether there were any harmful effects to general human health. As well as confirming that water fluoridation reduces levels of tooth decay, the review also found that it was safe.

Specifically, the report concluded that "there is no evidence that fluoride is responsible for any disorder of the thyroid". It also confirmed that iodine deficiency was the root cause of goitre, and that fluoride does not significantly influence the thyroid's uptake of iodine.

12. Hughes: "Second, people with kidney dysfunction do not clear fluoride from their body as well as others. This build-up puts them at significant risk for skeletal fluorosis"

Facts:

A. There is no valid, peer-reviewed scientific evidence of any adverse on the kidneys from optimal level fluoride.

B. "Because the kidneys are constantly exposed to various fluoride concentrations, any health effects caused by fluoride would likely manifest themselves in kidney cells. However, several large community-based studies of people with long-term exposure to drinking water with fluoride concentrations up to 8 ppm have failed to show an increase in kidney disease."

-----https://www.kidney.org/atoz/pdf/Fluoride_Intake_in_CKD.pdf

"People exposed to optimally fluoridated water will consume 1.5mg of fluoride per day. Available studies found no difference in kidney function between people drinking optimally fluoridated and non-fluoridated water. There is discrepant information in studies relating to the potential negative effects of consuming water with greater than 2.0ppm of fluoride."

"Available literature indicated that impaired kidney function results in changes in fluoride retention and distribution in the body. People with kidney impairment showed a decreased urine fluoride and increased serum and bone fluoride correlated with degree of impairment; however, there was no consistent evidence that the retention of fluoride in people with stage four or stage five CKD, consuming optimally fluoridated water, resulted in negative health consequences."

----Ludlow M, Luxton G, Mathew T. Effects of fluoridation of community water supplies for people with chronic kidney disease. *Nephrol Dial Transplant* 2007; 22:2763-2767

13. Hughes: "This build-up puts them at significant risk for skeletal fluorosis."

Facts:

In the 74.7% fluoridated United States, with hundreds of millions having ingested optimally fluoridated water for the past 71 years, if skeletal fluorosis was attributable to optimal level

fluoride, this disorder would be rampant in the US by now. Skeletal fluorosis is so rare in the US as to be nearly non-existent.

14. Hughes: "Third and most important, there are now over 30 studies that have reported that small levels of fluoride exposure can have negative effects on IQ".

Facts:

The "reduced IQ studies" are a reference to a 2011 review of a number of Chinese studies dug out of obscure Chinese journals by researchers Phillippe Grandjean and Anna Choi. These studies were of the effects of high levels of fluoride (as high as 11.5 ppm) in the well-water of various Chinese, Mongolian, and Iranian villages.

After excluding studies which were so seriously flawed that they did not even warrant review, Grandjean and Choi ended up with 27 in their review. By their own admission these studies had key information missing, inadequate control for confounders, and questionable methodologies. These 27 studies were so seriously flawed that Grandjean and Choi were led to issue a public statement in March, 2012 that the studies should not be used to judge water fluoridation in the US.

"These results do not allow us to make any judgment regarding possible levels of risk at levels of exposure typical for water fluoridation in the U.S. On the other hand, neither can it be concluded that no risk is present. We therefore recommend further research to clarify what role fluoride exposure levels may play in possible adverse effects on brain development, so that future risk assessments can properly take into regard this possible hazard."

--Anna Choi, research scientist in the Department of Environmental Health at HSPH, lead author, and Philippe Grandjean, adjunct professor of environmental health at HSPH, senior author (23)

— — https://cdn1.sph.harvard.edu/wp-content/uploads/sites/21/2012/07/Media-Statement_Fluoride-9-12-12-Revised2.pdf

As the authors of the review of the "IQ studies" cautioned that these studies should not be used to judge fluoridated water in the US, it is a mystery why Hughes chooses to attempt to do so anyway.

15. Hughes: "The studies conducted overseas [in Chinese, Mongolian, and Iranian villages in areas of high environmental fluoride pollution], have led the National Research Council to agree that the consistency of the results of fluoride/IQ studies is significant enough to warrant additional research of the effects of fluoride on intelligence.

Facts:

The 2006 NRC Committee on Fluoride in Drinking Water was charged to evaluate the adequacy of the EPA primary and secondary MCLs for fluoride, 4.0 ppm and 2.0 ppm respectively, to protect against adverse effects. The final recommendation of this Committee was for the

primary MCL to be lowered from 4.0 ppm. The sole reasons cited by the Committee for this recommendation were the risk of severe dental fluorosis, bone fracture, and skeletal fluorosis, with chronic ingestion of water with a fluoride content of 4.0 ppm or greater. Nothing else. Had this Committee deemed there to be any other concerns with fluoride at this level, including any "IQ reduction", it would have been responsible for stating so and recommending accordingly. It did not.

Additionally, the NRC Committee made no recommendation to lower the secondary MCL of 2.0 ppm. Water is fluoridated at 0.7 ppm, one third the level which the 2006 NRC Committee on Fluoride in Drinking Water made no recommendation to lower.

In March of 2013, Dr. John Doull, Chair of the 2006 NRC Committee on Fluoride in Drinking Water made the following statement:

"I do not believe there is any valid, scientific reason for fearing adverse health conditions from the consumption of water fluoridated at the optimal level"

---John Doull, MD, PhD, Chair of the National Academy of Sciences, National Research Council 2006 Committee Report on Fluoride in Drinking Water

16. Hughes: "If you search the literature closely you will see major universities, including Harvard University are in agreement that there is not enough evidence to say there is a definite benefit over risk and more randomized controlled studies need to be done."

Facts:

A. Neither Harvard nor any other respected University has issued any such statements as claimed here by Hughes.

B. "major universities" understand that randomized controlled studies are infeasible for large public health initiatives such as water fluoridation, and for that reason will never be done. These Universities, as well as the rest of respected science, are aware of the large volumes of peer-reviewed observational studies that have been done and recognize the validity of the conclusions of these studies.

C. From the 2015 Cochrane Review:

"However, there has been much debate around the appropriateness of GRADE when applied to public health interventions, particularly for research questions where evidence from randomised controlled trials is never going to be available due to the unfeasibility of conducting such trials. Community water fluoridation is one such area."

and

"However, we accept that the terminology of 'low quality' for evidence may appear too judgmental. We acknowledge that studies on water fluoridation, as for many public health interventions, are complex to undertake and that researchers are often constrained in their study design by practical considerations. For many public health interventions, the GRADE

framework will always result in a rating of low or very low quality. Decision makers need to recognise that for some areas of research, the quality of the evidence will never be 'high' and that, as for any intervention, the recommendation for its use depends not just upon the quality of the evidence but also on factors such as acceptability and cost-effectiveness (Burford 2012)."

-----Water fluoridation for the prevention of dental caries (Review)

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Effectiveness Studies

1) 2015

Results:

In the 3 areas the proportion of children who received a dental examination varied; 77.5% (n=825) for the fluoridated area, 80.1% (n=781) for the pre-fluoridated area and 55.3% (n=523) for the non-fluoridated area. The mean dmft was 1.40 for the fluoridated area, 2.02 for the pre-fluoridated area and 2.09 for the non-fluoridated area. These differences were statistically significant ($p < 0.01$). Differences were also noted in the proportion of children who were caries free, 62.6% fluoridated area, 50.8% for the pre-fluoride area and 48.6% for the non-fluoride location.

Conclusion

The children living in the well-established fluoridated area had less dental caries and a higher proportion free from disease when compared with the other two areas which were not fluoridated. Fluoridation demonstrated a clear benefit in terms of better oral health for young children.

---The Dental Health of primary school children living in fluoridated, pre-fluoridated and non-fluoridated communities in New South Wales, Australia

Anthony S Blinkhorn, Roy Byun, George Johnson, Pathik Metha, Meredith Kay, and Peter Lewis
BMC Oral Health 2015, 15:9 doi:10.1186/1472-6831-15-9<http://www.biomedcentral.com/1472-6831/15/9>

2) RESULTS:

The prevalence of dental caries was inversely related and the prevalence of fluorosis was directly related to the concentration of fluoride in the drinking water. The mean DMFS in the communities with 0.8 to 1.4 ppm fluoride was 53.9 percent to 62.4 percent lower than that in communities with negligible amounts of fluoride. Multivariate analysis showed that water fluoride level was the strongest factor influencing DMFS scores. The prevalence of fluorosis ranged from 1.7 percent to 15.4 percent, and the increase in fluorosis with increasing fluoride exposure was limited entirely to the milder forms.

-----J Public Health Dent. 2000 Summer;60(3):147-53.

The prevalence of dental caries and fluorosis in Japanese communities with up to 1.4 ppm of

naturally occurring fluoride.

Tsutsui A, Yagi M, Horowitz AM.

Department of Preventive Dentistry, Fukuoka Dental College, Fukuoka, Japan. tutuia@college.fdcnet.ac.jp

<http://www.ncbi.nlm.nih.gov/pubmed/11109211>

3) 2000

CONCLUSIONS:

Caries levels are lower among children with fluoridated domestic water supplies. Decay levels are much lower in 2002 than they were in 1984 and in the 1960s. The oral health of the less well off is worse than that of the rest of the population. The prevalence of dental fluorosis is higher amongst children and adolescents with fluoridated water supplies. Comparisons with 1984 data show an increase in the prevalence of fluorosis since that time.

----Community Dent Health. 2004 Mar;21(1):37-44.

Dental caries and enamel fluorosis among the fluoridated and non-fluoridated populations in the Republic of Ireland in 2002.

Whelton H, Crowley E, O'Mullane D, Donaldson M, Kelleher V, Cronin M.

Source

Oral Health Services Research Centre, University Dental School and Hospital, Wilton, Cork, Ireland.

4) <http://www.ncbi.nlm.nih.gov/pubmed/7643331>

CONCLUSIONS:

The ingestion of water containing 1 ppm or less fluoride during the time of tooth development may result in dental fluorosis, albeit in its milder forms. However, in these times of numerous products containing fluoride being available, children ingesting water containing 1 ppm fluoride continue to derive caries protection compared to children ingesting water with negligible amounts of fluoride. Thus, the potential for developing a relatively minor unesthetic condition must be weighed against the potential for reducing dental disease.

----J Public Health Dent. 1995 Spring;55(2):79-84.

Dental fluorosis and caries prevalence in children residing in communities with different levels of fluoride in the water.

Jackson RD, Kelly SA, Katz BP, Hull JR, Stookey GK.

Source

Oral Health Research Institute, Indianapolis, IN 46202-2876, USA.

<http://www.ncbi.nlm.nih.gov/pubmed/15074871>

5) 2004

Conclusions:

The results of this study support existing work suggesting water fluoridation together with the use of fluoridated dentifrice provides improved caries prevention over the use of fluoridated dentifrice alone. The social gradient between caries and deprivation appears to be lower in the fluoridated population compared to the non-fluoridated population, particularly when considering caries into dentine, demonstrating a reduction in inequalities of oral health for the most deprived individuals in the population.

---The association between social deprivation and the prevalence and severity of dental caries and fluorosis in populations with and without water fluoridation

Michael G McGrady, Roger P Ellwood, [...], and Iain A Pretty

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3543717/>

6) 2012

CONCLUSIONS:

Fewer studies have been published recently. More of these have investigated effect at the multi-community, state or even national level. The dmf/DMF index remains the most widely used measure of effect. % CR were lower in recent studies, and the 'halo' effect was discussed frequently. Nevertheless, reductions were still substantial. Statistical control for confounding factors is now routine, although the effect on per cent reductions tended to be small. Further thought is needed about the purpose of evaluation and whether measures of effect and study design are appropriate for that purpose.

-----Community Dent Oral Epidemiol. 2012 Oct;40 Suppl 2:55-64. doi: 10.1111/j.1600-0528.2012.00721.x.

Effectiveness of water fluoridation in caries prevention.

Rugg-Gunn AJ, Do L.

Source

Newcastle University, UK. andrew@rugg-gunn.net

<http://www.ncbi.nlm.nih.gov/pubmed/22998306>

7) 2012

CONCLUSIONS:

Data showed a significant decrease in dental caries across the entire country, with an average reduction of 25% occurring every 5 years. General trends indicated that a reduction in DMFT index values occurred over time, that a further reduction in DMFT index values occurred when a municipality fluoridated its water supply, and mean DMFT index values were lower in larger than in smaller municipalities.

----Int Dent J. 2012 Dec;62(6):308-14. doi: 10.1111/j.1875-595x.2012.00124.x.

Decline in dental caries among 12-year-old children in Brazil, 1980-2005.

Lauris JR, da Silva Bastos R, de Magalhaes Bastos JR.

Source

Department of Paediatric Dentistry, University of São Paulo, Bauru, São Paulo, Brazil. jrlauris@fob.usp.br

<http://www.ncbi.nlm.nih.gov/pubmed/23252588>

8). 2012

Abstract

The effectiveness of fluoridation has been documented by observational and interventional studies for over 50 years. Data are available from 113 studies in 23 countries. The modal reduction in DMFT values for primary teeth was 40-49% and 50-59% for permanent teeth. The pattern of caries now occurring in fluoride and low-fluoride areas in 15- to 16-year-old children illustrates the impact of water fluoridation on first and second molars.

---Caries Res. 1993;27 Suppl 1:2-8.

Efficacy of preventive agents for dental caries. Systemic fluorides: water fluoridation.

Murray JJ.

Source

Department of Child Dental Health, Dental School, University of Newcastle upon Tyne, UK.

<http://www.ncbi.nlm.nih.gov/pubmed/8500120>

9) 1993

CONCLUSIONS:

The survey provides further evidence of the effectiveness in reducing dental caries experience up to 16 years of age. The extra intricacies involved in using the Percentage Lifetime Exposure method did not provide much more information when compared to the simpler Estimated Fluoridation Status method.

----Community Dent Health. 2012 Dec;29(4):293-6.

Caries status in 16 year-olds with varying exposure to water fluoridation in Ireland.

Mullen J, McGaffin J, Farvardin N, Brightman S, Haire C, Freeman R.

Source

Health Service Executive, Sligo, Republic of Ireland. joej.mullen@hse.ie

<http://www.ncbi.nlm.nih.gov/pubmed/23488212>

10). 2012

CONCLUSIONS:

Children with severe dental caries had statistically significantly lower numbers of lesions if they lived in a fluoridated area. The lower treatment need in such high-risk children has important

implications for publicly-funded dental care.

-----Community Dent Health. 2013 Mar;30(1):15-8.

Fluoridation and dental caries severity in young children treated under general anaesthesia: an analysis of treatment records in a 10-year case series.

Kamel MS, Thomson WM, Drummond BK.

Source

Department of Oral Sciences, Sir John Walsh Research Institute, School of Dentistry, The University of Otago, Dunedin, New Zealand.

Research Design: Consecutive clinical case series: clinical details (diagnoses and the treatments provided) were recorded for children who had received comprehensive dental care under GA between 2000 and 2009. Age, gender, ethnicity, socio-economic status and fluoridation status (determined from the residential address) were also recorded.

<http://www.ncbi.nlm.nih.gov/pubmed/23550501>