Fluoridated water and the developing brain

May 2024

Expert panel meeting on the health effects of fluoride in drinking water: Summary report

June 8-9, 2023

Neurocognitive effects

Summary of information provided to the panel by Health Canada

A growing body of evidence suggests that fluoride in drinking water may be associated with reduced IQ scores in children at fluoride levels that may be found in Canadian drinking water. Health Canada commissioned an independent systematic review, which concluded that, on the basis of the weight of evidence, cognitive dysfunction (specifically, reduced IQ scores in children) should be considered as a candidate endpoint when setting the health-based value for fluoride in drinking water[3].

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Original Investigation | Public Health

May 20, 2024

Maternal Urinary Fluoride and Child Neurobehavior at Age 36 Months

Ashley J. Malin, PhD[1,2]; Sandrah P. Eckel, PhD[3]; Howard Hu, MD, MPH, ScD[3]; et al

» Author Affiliations | Article Information

JAMA Netw Open. 2024;7(5):e2411987. doi:10.1001/jamanetworkopen.2024.11987

Key Points

Question Is prenatal fluoride exposure associated with child neurobehavior in a US-based sample?

Findings In this cohort study of 229 pregnant women and their children, a 0.68 mg/L (ie, 1 IQR) increase in specific gravity–adjusted maternal urinary fluoride during pregnancy was associated with nearly double the odds of T scores for total child neurobehavioral problems being in the borderline clinical or clinical range.

Meaning These findings suggest that prenatal fluoride exposure may increase risk of neurobehavioral problems among children living in an optimally fluoridated area in the US.

Listen

Review Articles

Systematic review of epidemiological and toxicological evidence on health effects of fluoride in drinking water

Mohamed Kadry Taher, Franco Momoli, Jennifer Go, Shintaro Hagiwara, Siva Ramoju, Xuefeng Hu, ...show all

Pages 2-34 | Received 09 Mar 2023, Accepted 27 Nov 2023, Published online: 06 Feb 2024

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Mohamed Kadry Taher
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University of Ottawa

Results

The current review identified 89 human studies, 199 animal studies, and 10 major *in vitro* reviews. The weight of evidence on 39 health endpoints was presented. In addition to dental fluorosis, evidence was considered strong for reduction in IQ scores in children, moderate for thyroid dysfunction, weak for kidney dysfunction, and limited for sex hormone disruptions.

A Benchmark Dose Analysis for Maternal Pregnancy Urine-Fluoride and IQ in Children

Philippe Grandjean ✉, Howard Hu, Christine Till, Rivka Green, Morteza Bashash, David Flora, Martha Maria Tellez-Rojo, Peter X.K. Song, Bruce Lanphear, Esben Budtz-Jørgensen

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…the [benchmark concentration] for maternal U-F associated with a 1-point decrease in IQ scores was 0.31 mg/L (BMCL, 0.19 mg/L) for the youngest boys and girls in the two cohorts, and 0.33 mg/L (BMCL, 0.20 mg/L) for the MIREC cohort and the older ELEMENT children. Thus, the joint data show a [benchmark concentration level] in terms of the adjusted U-F concentrations in the pregnant women of approximately 0.2 mg/L. These results can be used to guide decisions on preventing excess fluoride exposure in pregnant women.

Dr. Philippe Grandjean

- Dr. Philippe Grandjean conducts international research to assess adverse health effects that are linked to exposures to environmental chemicals, especially those that occur prenatally during highly vulnerable early life stages.
- Dr. Grandjean also serves as Professor of Environmental Medicine at the University of Southern Denmark, and he has previously been part-time at Harvard T.H. Chan School Public Health for 20 years.
- In 2002, Grandjean became founding Editor-in-Chief of the open-access journal Environmental Health that has become a major medium for publishing research in this field.
- His book “Only on chance – and How to Protect the Brains of the Next Generation” was published in 2013 by Oxford University Press.
- Among several awards for his research, he has received the ‘Mercury madness award’ for excellence in science in the public interest, from eight US environmental organizations in 2004, in 2016 the John R. Goldsmith Award from the International Society for Environmental Epidemiology, and the Needleman Award in Children’s Environmental Health from the International Society for Children’s Health and the Environment in 2022.
- He served as a member of European Environment Agency’s scientific committee in 2012-2020 and of the World Health Organization’s European Advisory Committee on Health Research in 2011-2017.

Source: https://web.uri.edu/steep/meet/philippe-grandjean/

Dr. Howard Hu

Dalla Lana School of Public Health

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UNIVERSITY OF TORONTO
DALLA LANA SCHOOL OF PUBLIC HEALTH

New Dalla Lana Director Appointed Expert in occupational and environmental medicine to lead Dalla Lana

November 11/2011

The **Dalla Lana School of Public Health's** new director brings with him an impressive pedigree from teaching and research stints at Harvard and the University of Michigan.

Dr. **Howard Hu** is an internist with credentials in occupational and environmental health, as well as a degree in epidemiology. The agenda committee of Academic Board approved his appointment at their Nov. 9 meeting.
Hu is currently the NSF International Department Chair in the Department of Environmental Health Sciences at the University of Michigan. He is also a professor of environmental health, epidemiology and internal medicine and director of the Michigan NIEHS Center for Research on Lifestage Exposures, Epigenetics and Adult Disease.

Prior to his appointment at Michigan, Hu taught at Harvard University where he was a professor of occupational and environmental medicine at the Harvard School of Public Health and the Channing Laboratory of the Brigham & Women's Hospital. He directed the Harvard metals epidemiology research group, the Center for Children's Environmental Health and Disease Prevention Research and the Harvard University residency program in occupational and environmental medicine.

Known for creative and innovative research on environmental health, Hu has focused on issues such as the adverse health effects of lead and other heavy metals, the impacts of gene/environment interactions, the long-term effects of fetal exposure to lead and other chemical toxicants and interactions between aging and the environment.

11 recent studies show that fluoride is not safe and/or effective

1. July 2024 Zhu et al. - **PKC-θ is an important driver of fluoride-induced immune imbalance of regulatory T cells/effector T cells** – This Chinese study explores the mechanism of fluoride interference in the immune system and the key indicators of fluoride-induced immune damage. It represents the first evidence suggesting that Protein Kinase C-θ (PKC-θ) may be the key to immune imbalance in the body under fluoride exposure.

2. May 2024 Malin AJ, Eckel SP, Hu H, et al. - **Maternal Urinary Fluoride and Child Neurobehavior at Age 36 Months. JAMA Netw Open** – This study Open found that prenatal fluoride exposure may increase risk of neurobehavioral problems among children living in an optimally fluoridated area in the US.

3. January, 2024: The LOTUS Study – With 6.4 million study subjects, this **is the largest fluoride study ever conducted**. Its aim was to determine the effectiveness and cost-effectiveness of water fluoridation for adults and adolescents. Over 10 years, people receiving optimally fluoridated water experienced **only a 2% reduction** in the number of decayed, missing, and filled teeth, compared to those whose water was not fluoridated. The study found NO meaningful benefit to water fluoridation, nor any compelling evidence that water fluoridation reduced social inequalities in dental health.

4. January 2024: Fluoride exposure and thyroid hormone levels in pregnancy – This is the first study to investigate sex differences in the association between fluoride exposure and maternal thyroid hormone levels in pregnancy. It found that 1 mg/L increase in urinary fluoride was associated with a **35% increase in thyroid stimulating hormone (TSH) among women pregnant with girls.** Urinary fluoride concentration is an objective biomarker of short-term fluoride exposure. It allows for more precise estimates of fluoride intake from multiple sources.This study ("*the MIREC Study*"), which started in 2007, is an ongoing study to examine the effects of prenatal exposure to environmental chemicals on the health of pregnant women and their infants.

5. November 2023: Systematic review of epidemiological and toxicological evidence on health effects of fluoride in drinking water – This Canadian study identifies both **dental fluorosis** and **reduction in children's IQ** scores as key endpoints for establishing a health-based value (HBV) for fluoride in drinking water. The authors state that neurodevelopmental cognitive effects may warrant special consideration in determining HBV.

6. September, 2023 – A study by University of Calgary researchers found "poorer inhibitory control and cognitive flexibility" in preschool children whose mothers were pregnant during times when the water was fluoridated in Calgary, Canada. The authors said their tests measured "executive function deficits [that have been] consistently associated with behavioural and neurodevelopmental disorders such as ADHD, autism spectrum disorder (ASD), intellectual disability, and specific learning disorders". Executive dysfunction disrupts the ability to manage thoughts, emotions, and actions, including the ability to pay attention, solve problems, listen, and multitask.

7. February 2023 Till et al., – Professor Christine Till and PhD student Meaghan Hall found an association between fluoride exposure from tap water and **hypothyroidism in pregnancy**. They say this latest study may explain an earlier study looking at maternal fluoride exposure in pregnancy and lower IQ in boys. *"The findings are concerning because hypothyroidism is a known cause of brain-based disorders in children,"* says Till. Hall and Till say they hope that policy makers will consider this new research when evaluating the safety of community water fluoridation.

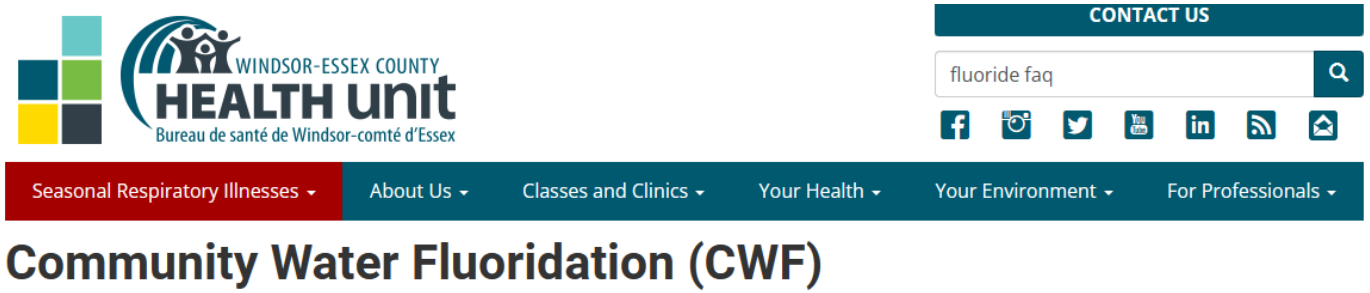
8. June 2021-- A Benchmark Dose Analysis for Maternal Pregnancy Urine-Fluoride and IQ in Children-- According to Harvard University's Prof. Philippe Grandjean MD, DMSc, *"Fluoride is causing a greater overall loss of IQ points today than lead, arsenic or mercury"*

9. 2020 Till et al., showed a **reduction in IQ when children were bottle-fed** as babies in communities which were fluoridated, compared with babies who were bottle-fed in non-fluoridated communities.

10. Oct 7 2020 According to Linda Birnbaum, Ph.D., former Director of the U.S. NIEHS (2009-2019) and two leading public health researchers (Bruce Lanphear, MD, MPH, and Christine Till, PhD), ingestion of fluoride during pregnancy confers no dental benefit to the foetus, so this is a situation where **risks are being taken for no proven benefit** (see their editorial published in Environmental Health News).

11. Well-designed prospective cohort studies funded by both the National Institute of Environmental Health Sciences [NIEHS] in the USA as well as Health Canada, have shown a **loss of IQ and increased symptoms of ADHD in offspring when pregnant women are exposed to fluoride at doses commonly experienced in fluoridated communities in Canada** (Bashash, 2017, 2018 and Green, 2019.

Public Health copied & pasted obsolete and incorrect information from the American Dental Association, without acknowledging any of the more recent studies



Community Water Fluoridation (CWF)

Is it safe to use fluoridated water to make breast-milk substitute for my infant?

Yes, infant formula can safely be prepared with water containing fluoride. Parents and caregivers should discuss any questions they may have with their health care providers.

For more information, contact your health care provider or read the American Dental Association's document called, Fluoridation Facts.

Does drinking water fluoridated at recommended levels have any effect on intelligence (IQ) in children or neurological impact?

The best available science-based evidence does not establish a causal relationship between drinking water fluoridated at recommended levels and lowered intelligence (IQ) or behavioural disorders in children. A number of systematic reviews and individual studies provide evidence that consumption of optimally fluoridated water at levels recommended in Canada (and the United States of America) of 0.7 mg/L do not lower IQ or cause behavior problems in children.

For an explanation of the research on fluoride and children's IQ, visit ilikemyteeth.org.

“Fluoridation Facts”: Taken from the American Dental Association

41. 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) or behavioral disorders in children.

Fact.
A number of systematic reviews and individual studies provide evidence that consumption of optimally fluoridated water at levels recommended in the U.S. (0.7 mg/L) does not lower IQ or cause behavior problems in children. The following conclusions from a number of systematic reviews and individual studies support the safety of community water fluoridation.

A number of systematic reviews and individual studies provide evidence that consumption of optimally fluoridated water at levels recommended in the U.S. (0.7 mg/L) does not lower IQ or cause behavior problems in children.

Disclaimer

This publication is designed to answer frequently asked questions about community water fluoridation, based on a summary of relevant published articles. It is not intended to be a comprehensive review of the extensive literature on fluoridation and fluorides or to promote professional advice. Readers must also rely on their own review of the literature, including the sources cited herein and any subsequently published, for a complete understanding of these issues.

This is the exact wording on WECHU’s website

ilikemyteeth.org

Beginning in 2012 with a research review[3] in the journal *Environmental Health Perspectives*, claims began to appear that lower IQ scores in children were "caused" by fluoride. There are many reasons why the evidence does not support these claims.

- This research did not test cause and effect. The authors examined a wide variety of studies from different countries (China, Mongolia and Iran) and different times (over 22 years) and reported what was observed. They did not conduct tests designed to examine a relationship between fluoride and IQ.
- The authors warn that the studies they reviewed "had deficiencies, in some cases rather serious, which limit the conclusions that can be drawn." They conclude that further research would be needed to rule out other factors that can affect test scores, such as nutrition, the quality of schools, or the presence of contaminants such as lead.
- The studies do not describe the water that American children drink. The fluoride in these countries was in some cases more than 10 times higher than the optimal level used in the United States.

Fact checks needed

So much more science since then

In 2014, one of the same authors again published a research review[4] in the British [illegible]nal *The Lancet Neurology*. This article included fluoride among a list of potentially [illegible]armful chemicals. Again claims resulted from this review that are not supported by the evidence.

- The article's information on fluoride came from *just one study*, the 2012 research review described above, which did not prove a cause and effect relationship between fluoride and the brain.

Read the actual study on the next page to see what the author really said

[4] Grandjean, P, Landrigan, PJ. Neurobehavioural effects of developmental toxicity. Lancet Neurol. 2014;13(3):330-338. http://www.thelancet.com/pdfs/journals/laneur/PIIS1474-4422(13)70278-3.pdf. Accessed June 20, 2018.

THE LANCET
Neurology

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Neurobehavioural effects of developmental toxicity

Dr Philippe Grandjean, MD • Philip J Landrigan, MD

Published: March, 2014 • DOI: https://doi.org/10.1016/S1474-4422(13)70278-3 • Check for updates

Summary

Neurodevelopmental disabilities, including autism, attention-deficit hyperactivity disorder, dyslexia, and other cognitive impairments, affect millions of children worldwide, and some diagnoses seem to be increasing in frequency. Industrial chemicals that injure the developing brain are among the known causes for this rise in prevalence. In 2006, we did a systematic review and identified five industrial chemicals as developmental neurotoxicants: lead, methylmercury, polychlorinated biphenyls, arsenic, and toluene. Since 2006, epidemiological studies have documented six additional developmental neurotoxicants—manganese, fluoride, chlorpyrifos, dichlorodiphenyltrichloroethane, tetrachloroethylene, and the polybrominated diphenyl ethers. We postulate that even more neurotoxicants remain undiscovered. To control the pandemic of developmental neurotoxicity, we propose a global prevention strategy. Untested chemicals should not be presumed to be safe to brain development, and chemicals in existing use and all new chemicals must therefore be tested for developmental neurotoxicity. To coordinate these efforts and to accelerate translation of science into prevention, we propose the urgent formation of a new international clearinghouse.

ilikemyteeth.org funding relating to oral health

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ARCORA Foundation
Bending the Arc of Oral Health Toward Equity

Source: About CDH | Campaign for Dental Health (ilikemyteeth.org)

What do dentists know about neurotoxicity in the developing brain?

Conclusions

1. **Public Health authorities are not keeping up with evolving science: Fluoridated water is not safe for babies**

2. **Dentists are not neurotoxicology experts. Dental organizations claiming there are no concerns relating to neurotoxicology are providing obsolete and incorrect information**

3. **Precautionary principle: Pregnant women and new parents should use non-fluoridated water to protect baby's developing brain**

4. **The science is evolving: Many recent high-quality peer-reviewed studies show health concerns associated with fluoride (even if the biological mechanism isn't yet fully understood)**