



Water Fluoridation in Calgary: A Closer Look at the O'Brien Institute Report

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Background

Canadian health officials report that tooth decay is “the most common, yet preventable, childhood chronic disease in Canada and around the world.” The consequences of poor dental health are far-reaching. Untreated decay can cause pain and broader infection in the body.¹ A nine-year study in the U.S. showed that 61,439 hospitalizations were caused primarily by dental infections (periapical abscesses), and 66 of these patients died.² Children with tooth decay are much more likely to be absent from school and perform poorly in their classes.³

A recent report by the University of Calgary’s O’Brien Institute for Public Health recognizes the overwhelming evidence that “community water fluoridation reduces the number of cavities” within the population served by a water system.⁴ Indeed, after community water fluoridation (CWF) ceased in the Canadian cities of Calgary and Windsor, tooth decay rose significantly.

In Calgary, the average decay rate for second-grade students soared 146%, a much higher change than the cavity trends for children in Edmonton—a city in the same province that remained fluoridated.⁵ As the O’Brien Report notes, Calgary’s much higher increase in cavities occurred “despite the fact that there was evidence of better dental treatment activities in Calgary.”⁶

The Windsor City Council ended CWF in 2013, but the councillors recently voted to resume fluoridation after a local report showed a 51% increase locally in the number of children who had tooth decay or required urgent dental care.⁷

The O’Brien Report points out that the Calgary research “is not standing alone with its findings of increased dental cavities after fluoride cessation. It stands alongside a number of other studies showing the same thing, both prior to and after the Calgary-Edmonton study.” One example the O’Brien Report gives is a 2018 study showing a significant rise in tooth decay after Alaska’s capital city ended CWF. This study examined the impact on low-income children in Juneau, Alaska and found that average Medicaid dental treatment costs per child jumped 47% after cessation. The impact on preschool-age children was especially disturbing. After CWF ended, the average preschool-age child needed one additional decay procedure each year at a cost of about \$300.⁸

Recognizing CWF’s Benefits

Overall, the O’Brien Report makes a positive contribution to the discussion about what Calgary officials should do to address its dramatic rise in tooth decay. For example, the report identifies crucial evidence reaffirming CWF’s ability to prevent dental disease. And the report makes this key observation about the positive impact CWF has on health equity:

Because a community water fluoridation program is population-wide in nature, it impacts the population as a whole and requires no special effort from community members. Fluoridation is beneficial for health equity, because it benefits everyone, but especially those who have limited resources to access oral hygiene and dental care. Evidence shows that socioeconomically disadvantaged community members have the least access to formal dental care due to cost and access challenges. This is very applicable to Calgary (and Alberta), where dental care is recognized as being particularly costly.

The O'Brien Report also educates the public by citing the evidence showing that CWF reduces the rate of tooth decay among adults. This is worth noting because many people believe fluoridation's benefits are limited to children.

Opponents of CWF often misrepresent dental fluorosis to raise the public's fear or concern. Dental fluorosis is a change in the appearance of tooth enamel resulting when children are exposed to higher than usual levels of fluoride during the tooth-forming years (age 8 and younger).⁹ As the O'Brien Report correctly states, dental fluorosis is "usually mild."¹⁰ Yet the report could have strengthened public knowledge by providing a larger context about the mild forms of dental fluorosis that occur in Canada and the U.S. For example:

- Mild forms of fluorosis do not cause pain and do not affect the function of the teeth.¹¹ These forms of fluorosis are so subtle that most people are not aware their teeth have fluorosis until a dental professional mentions it.¹²
- The occurrence of dental fluorosis depends on *total* fluoride exposure—not just whether CWF exists in a community.¹³
- A study of more than 7,600 U.S. children found that unlike tooth decay, dental fluorosis "had no impact on the [oral health-related quality of life] of children or their families."¹⁴
- Research points to the use of fluoride toothpaste as a primary factor shaping the incidence of fluorosis. A study in a fluoridated Brazilian community found that the three most important factors associated with dental fluorosis were all related to toothpaste and toothbrushing.¹⁵ A study in a large U.S. city revealed fluorosis rates were higher among a subgroup of children who were more likely to brush with large amounts of toothpaste.¹⁶

Where O'Brien Misses the Mark

Although the O'Brien Report calls attention to a variety of important evidence about fluoride and fluoridation, it misses the mark in some areas. In its section reviewing the issue of "Cognition," the O'Brien Report was not as rigorous as it could have been. For example:

- The report should have identified the methodological limitations of the Bashash study, which examined urine samples in pregnant women. The O'Brien Report did not mention several uncontrolled confounders that could have affected or skewed the Bashash study's results. These include the lack of information about iodine in salt, lack of data on fluoride content in local drinking water, and the lack of information on exposure to arsenic (a well-known neurotoxicant). Moreover, the Bashash study relied on spot urine samples instead of 24-hour samples, which are considered more reliable.

- Some coauthors of the Bashash study have cautioned the public and health journalists from drawing sweeping conclusions from their journal article. One of those coauthors is Dr. E. Angeles Martinez Mier, a professor of cariology at Indiana University School of Dentistry. Dr. Martinez Mier has written this statement:

While I stand fully behind our study's conclusions, as an individual, I am happy to go on the record to say that I continue to support water fluoridation.

If I were pregnant today I would limit my fluoride intake. I would continue to consume fluoridated water, but would avoid other sources that could increase my fluoride intake, for example if I lived in Mexico I would limit my salt intake.

I am involved in this research because I am committed to contribute to the science to ensure fluoridation is safe for all. Our study is rigorous, our team of researchers does not have an agenda, and will go where the data take us.

- The report makes no mention at all of the animal study conducted and published last year by the U.S. National Toxicology Program (NTP). This is a surprising oversight. The NTP is a highly respected research program, and its study was commissioned to examine how, if at all, three levels of fluoride exposure might affect cognition. The NTP researchers concluded that “we observed no exposure-related differences in motor, sensory, or learning and memory performance” in the wake of fluoride exposure.¹⁷ After the NTP announced plans to conduct this study, the leading anti-fluoride group in the U.S. posted an article praising the NTP’s “cutting-edge scientific tools” and predicting that the study’s findings “could end fluoridation.”¹⁸
- The O’Brien Report omits a key point about the 27 studies (mostly from China) that were reviewed by Harvard researchers in a 2012 journal article. These studies compared the IQ scores of children in areas where drinking water had high levels of fluoride with kids living in areas where the water had lower fluoride levels. The latter category served as the control group. The IQ scores were 7 points lower in the areas with high fluoride levels. However, in the control group where fluoride in the water was in the range of optimally fluoridated water, no IQ deficits were noted. In other words, the high fluoride levels were *not* an accurate representation of exposure in a fluoridated city.¹⁹
- In its Cognition section, the O’Brien Report included studies from a publication called *Fluoride*, which was simply described as a journal “specifically interested in fluoride.” That description is misleading and incomplete. As the Pew Charitable Trusts explained, *Fluoride* is a publication “managed by fluoride opponents (that) has published a number of flawed or scientifically incomplete studies. The articles in *Fluoride* do not undergo the rigorous level of peer review by independent scientists that is standard protocol for reputable journals.”²⁰ Readers of the O’Brien Report deserved to know that this source lacks the credibility of a typical peer-reviewed scientific journal.

Medical and scientific leaders have not viewed the Bashash study’s findings as sufficiently strong to alter their recommendations to patients and the public. For example, a few days after the Bashash study was released, the American Congress of Obstetricians and Gynecologists

posted a message on Twitter reaffirming its support for guidelines recommending fluoridated water and fluoridated toothpaste for pregnant women.²¹

An Odd Choice as Consultant

One reason why the O'Brien Report sometimes veers off course might be related to its decision to include Paul Connett as an external consultant. The report identifies Connett as executive director of the Fluoride Action Network (FAN), "a U.S.-based group that is passionately opposed to community water fluoridation."²² Connett is indeed passionate, but this passion may reveal why he and his organization have a track record of circulating information that is false, misleading or irrelevant.²³

Had the O'Brien Institute conducted a detailed review of Connett and FAN, we believe it would have recognized Connett is not a credible source. In 2011, FAN posted content that made a false assertion about the fluoride-related activities of the Pew Charitable Trusts, a large U.S. foundation.²⁴ After Connett met with editors at the largest newspaper in the state of Wisconsin, the newspaper published an editorial noting that his arguments against CWF "aren't based on much more than anecdote, conjecture and studies that aren't particular relevant to the U.S. practice of community water fluoridation."²⁵

Connett is driven by ideology, not science. This is reflected by the fact that FAN joined a coalition in 2011 with an anti-vaccination group; Connett and his wife later wrote that they "were happy to join" this coalition.²⁶

Connett and his group have promoted or encouraged baseless conspiracy theories about both fluoride and the 9/11 terrorist attacks in multiple U.S. cities.²⁷ Connett has appeared multiple times on the InfoWars radio/online show hosted by Alex Jones, a Texan whose outlandish conspiracy theories led social media platforms to ban or restrict his content.²⁸ Years ago, FAN praised an anti-fluoride leader named John Yiamouyiannis, calling him "a man of true honor and integrity." Besides attacking fluoride, Yiamouyiannis co-wrote a book claiming falsely that the HIV virus did not cause AIDS.²⁹

Conclusion

Fluoride is studied or cited in more than 59,000 scientific articles published online by the U.S. National Library of Medicine (NLM). More than 6,500 articles specifically citing fluoridation are included in the NLM's online database.³⁰ Simply put, few public health topics have been researched with the vigor and depth as fluoride and fluoridation.

We welcome more research, but those who constantly say "we need more research" are likely to never declare themselves satisfied—no matter how many more studies are published. The balance of the evidence strongly supports the effectiveness and safety of CWF. Those who use the "more research" refrain to justify Calgary's cessation of CWF are doing a disservice to the health and well-being of children and adults.

Much of the concern that exists about fluoride can be traced to online bulletin boards and social media sites with little or no scientific rigor. In a recent article in the *Journal of the American*

Medical Association, two Canadian physicians warned of the “torrents of misinformation” about fluoridation, vaccinations and other health-related topics driven by digital communication.³¹

Overall, the O’Brien Report has done a helpful job of reviewing the scientific literature and identifying key findings. Nonetheless, we are disappointed by the report’s Cognition section and the Institute’s choice of external consultants.

Tooth decay has risen dramatically among Calgary children since city officials voted to end CWF. Children cannot vote. They count on adults to make wise policy decisions. And they count on adults who have made ill-advised decisions to “own” their mistakes and correct them. We sincerely hope the Calgary City Council will vote soon to resume CWF.

Sources:

¹ Oral health for children. Government of Canada. Sep 10, 2018. Accessed Aug 4, 2019 at <https://www.canada.ca/en/public-health/topics/oral-health/caring-your-teeth-mouth/children.html>.

² Shah AC, Leong KK, Lee MK, Allareddy V. Outcomes of hospitalizations attributed to periapical abscess from 2000 to 2008: a longitudinal trend analysis. *Journal of Endodontics*. Sep 2013, 39:9.

³ Jackson SL, Vann WF Jr, Kotch JB, Pahel BT, Lee JY. Impact of Poor Oral Health on Children’s School Attendance and Performance. *American Journal of Public Health*. Oct 2011, 101:10; Seirawan H, Faust S, Mulligan R. The Impact of Oral Health on the Academic Performance of Disadvantaged Children. *American Journal of Public Health*. Sep 2012, 102:9.

⁴ Community Water Fluoridation: A Report for Calgary City Council. University of Calgary, O’Brien Institute for Public Health. July 2019, 9.

⁵ McLaren L, Patterson S, Thawer S, Faris P, McNeil D, Potestio M, Shwart L. “Measuring the short-term impact of fluoridation cessation on dental caries in Grade 2 children using tooth surface indices.” *Community Dentistry and Oral Epidemiology*. 2016, 44:3.

⁶ O’Brien Institute for Public Health. July 2019, 15.

⁷ Cross B. “Council votes 8-3 to resume fluoridating water.” *Windsor Star*. Dec 18, 2018. Accessed in July 2019 at <https://windsorstar.com/news/local-news/council-votes-8-3-to-resume-fluoridating-water>; Windsor-Essex Health Unit. Oral Health 2018 Report: Executive Summary. Accessed in July 2019 at <https://www.wechu.org/reports/oral-health-2018-report>.

⁸ Meyer J, Margariti V, Mendelsohn A. “Consequences of community water fluoridation cessation for Medicaid-eligible children and adolescents in Juneau, Alaska.” *BMC Oral Health*. 2018, 18:215.

⁹ Community Water Fluoridation: Fluorosis. U.S. Centers for Disease Control and Prevention. Mar 8, 2019. Accessed in Aug 2019 at https://www.cdc.gov/fluoridation/faqs/dental_fluorosis/index.htm.

¹⁰ O’Brien Institute for Public Health. July 2019, 10.

¹¹ What Is Fluorosis? Campaign for Dental Health, American Academy of Pediatrics. Accessed in Aug 2019 at <https://ilikemyteeth.org/what-is-fluorosis/>.

¹² Fluorosis. American Dental Association. Accessed in Aug 2019 at <https://www.mouthhealthy.org/en/az-topics/f/fluorosis>.

- ¹³ Aoba T, Fejerskov O. Dental fluorosis: chemistry and biology. *Critical Reviews in Oral Biology & Medicine*. 2002, 13:2.
- ¹⁴ Onoriobe U, Rozier RG, Cantrell J, King RS. Effects of Enamel Fluorosis and Dental Caries on Quality of Life. *Journal of Dental Research*. 2014, 93:10.
- ¹⁵ Celeste RK, Luz PB. Independent and Additive Effects of Different Sources of Fluoride and Dental Fluorosis. *Pediatric Dentistry*. May-Jun 2016, 38:3.
- ¹⁶ Martinez-Mier EA, Soto-Rojas AE. Differences in exposure and biological markers of fluoride among white and African American children. *Journal of Public Health Dentistry*. 2010, 70:3.
- ¹⁷ McPherson CA, Zhang G, Gilliam R, Brar SS, Wilson R, Brix A, Picut C, Harry GJ. An Evaluation of Neurotoxicity Following Fluoride Exposure from Gestational Through Adult Ages in Long-Evans Hooded Rats. *Neurotoxicity Research*. Nov 2018, 34:4.
- ¹⁸ New Fluoride/Brain Study Could End Fluoridation. Fluoride Action Network. Dec 11, 2015. Accessed in Aug 2019 at <http://bit.ly/31E1e90>.
- ¹⁹ Choi AL, Sun G, Zhang Y, Grandjean P. Developmental Fluoride Neurotoxicity: A Systematic Review and Meta-Analysis. *Environmental Health Perspectives*. Oct 2012, 120:10.
- ²⁰ “Not all studies carry equal weight.” Pew Center on the States. Apr 2012. Accessed in Aug 2019 at <http://bit.ly/2yEIdpO>.
- ²¹ Oral Health during Pregnancy and Through the Lifespan. American College of Obstetricians and Gynecologists. No. 569, Aug 2013. Reaffirmed in 2017. Accessed in Aug 2019 at <https://www.acog.org/Clinical-Guidance-and-Publications/Committee-Opinions/Committee-on-Health-Care-for-Underserved-Women/Oral-Health-Care-During-Pregnancy-and-Through-the-Lifespan>.
- ²² O’Brien Institute for Public Health. July 2019, 6.
- ²³ Can You Trust What Paul Connett Says? Campaign for Dental Health, American Academy of Pediatrics. 2013. Accessed in Aug 2013 at https://ilikemyteeth.org/wp-content/uploads/2013/07/Connett_Can-You-Trust.pdf.
- ²⁴ Letter from the Pew Charitable Trusts to Paul Connett at the Fluoride Action Network. Nov 17, 2011. Accessed in Aug 2019 at <http://bit.ly/2T5MUmc>.
- ²⁵ Stick with fluoridation; it's safe and it works. Milwaukee Journal Sentinel. May 31, 2012. Accessed in Aug 2019 at http://archive.jsonline.com/news/opinion/stick-with-fluoridation-its-safe-and-it-works-fe5k91n-156051935.html?subscriber_login=y.
- ²⁶ Connett P, Connett E. Major Progress at Eliminating Fluoride in Water Supplies by Fluoride Action Network. Mercola.com. Jun 26, 2012. Accessed in Aug 2019 at <https://articles.mercola.com/sites/articles/archive/2012/06/26/health-liberty-fan-anniversary.aspx>.
- ²⁷ The Fluoride Action Network promotes a conspiracy theory. American Fluoridation Society. 2015. Accessed in Aug 2019 at <http://bit.ly/2M0iTmR>; Can You Trust What Paul Connett Says?
- ²⁸ Nimmo K. Fluoride Hoax Exploding: Alex Jones Interviews Dr. Paul Connett. InfoWars. May 25, 2011. Accessed in Aug 2019 at <https://www.infowars.com/fluoride-hoax-exploding-alex-jones-interviews-dr-paul-connett-2/>; Higgins T. Alex Jones’ 5 most disturbing and ridiculous conspiracy theories. CNBC. Sep 14, 2018. Accessed in Aug 2019 at <https://www.cnbc.com/2018/09/14/alex-jones-5-most-disturbing-ridiculous-conspiracy-theories.html>.

²⁹ FAN's connections to John Yiamouyiannis. American Fluoridation Society. Accessed in Aug 2019 at <http://bit.ly/2M1yFOi>.

³⁰ Both searches were conducted online at the website of the U.S. National Library of Medicine (National Institutes of Health) on Aug 5, 2019 at <https://www.ncbi.nlm.nih.gov/pubmed/>.

³¹ Armstrong PW, Naylor CD. Counteracting Health Misinformation: A Role for Medical Journals? Journal of the American Medical Association. Apr 22, 2019 (<https://doi.org/10.1001/jama.2019.5168>).