



Fluoridation: Dental Health or Health Detriment?

CASE STUDY

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*This case study highlights three tactics of science misinformation and disinformation efforts: creation of false legitimacy in order to fabricate a fake scientific controversy, putting forth conspiracy theories, and avoiding peer review. See **Characteristics of Science Misinformation/Disinformation Efforts** for more information regarding these tactics and **Water Fluoridation: Misuse of Valid Science to Create Doubt** for the companion story to this case study.*



Numbered red flags refer to descriptions of misinformation and disinformation provided at the end of the case study.

The Brazos Valley region in Texas relies on deep wells drilled to access underwater aquifers to supply drinking water to its residents. College Station, a city at the heart of the region, has begun exploring chemical treatment plans for improving citizens' health and quality of drinking water. Mayor Flora Dayton has called a town hall to discuss options with local stakeholders.

Mayor: Currently, water fluoridation is a regular part of the city's water treatment process. The focus of this town hall is to discuss positions regarding the community's decision to practice water fluoridation. I will now open up the floor for discussion; please include your name for the record.

Kane: My name is Kane, and I am just a simple citizen who is here to put a stop to this madness. Fluoride is a chemical and people shouldn't drink chemicals.

Dan: Hello, I am Dan and work as a dentist in the Brazos Valley. I think there is some confusion about what water fluoridation is and why we do it. Our drinking water naturally contains chemicals, including fluoride. Water fluoridation is just the process of adjusting the quantity of fluoride in drinking water so that the levels fall within a desired range. The practice is accompanied by a long-documented record of effective implementation and positive outcomes, particularly for children's dental health.

Kane: Fact: toothpaste contains fluoride for our dental health too and we are told to call poison control if swallowed. Scientists recognize these chemicals as dangerous!

Dan: Fluoride *can* be dangerous, but the context of the scientists' claims is important to consider. Much like with chlorinated water, there is a saying that "the dose makes the poison." In this case, any potential concerns are related to the amount and concentration of fluoride ingested in relation to the amount of water. Current practices are endorsed by the World Health Organization, the Centers for Disease Control and Prevention, the Environmental Protection Agency, the American Dental Association, and numerous other professional organizations (TxOHC, 2022).



Kane: Dentist Dan is part of a huge cover up to hide evidence and keep people under control. Fluoride makes you dumb and docile.



Dan: For your argument to be true *hundreds of thousands* of dentists, scientists, and other public health experts from around the world would have to be secretly working together to lie to people. Putting forth such outlandish conspiracy theories about suppressing certain opinions from being published is a common theme across sources of misinformation and disinformation.

When large diverse groups of experts and professional organizations concur with and endorse scientific claims, how does that affect the trustworthiness of the claims? How does that affect the feasibility that a widespread conspiracy regarding science can occur?

Mayor: Thank you Kane and Dan. Our task force manager, Charlie, has just arrived and will be updating us on the progress.

Charlie: As the task force began the information gathering stage, we drew from the experiences of three cities: Harmony, Sharpsburg, and Lions City. In all three cases, the cities stopped water fluoridation, readopted the practice, and then rejected the practice a second time.

Kane: See, others have rightly rejected dangerous water fluoridation and we should too!

Mayor: Slow down, Kane. Harmony has since reintroduced water fluoridation. Issues of this nature are complex and include human health, ethical, and economic considerations, along with the scientific dimensions. We need to consider multiple aspects and investigate the similarities and differences between our contexts.

	Harmony	Sharpsburg	Lions City
Natural Fluoride	0.3 mg/L	1.2 mg/L	0.5 mg/L
Natural Treatment Budget Allocation	3%	2%	9%
Under 14 Population	11,000 of 40,000	6,000 of 48,000	19,000 of 100,000
Decision	Reintroduce Fluoridation	Stop Fluoridation	Stop Fluoridation

Case Cities Comparison Data

Charlie: Precisely. The cases of Harmony, Sharpsburg, and Lions City all had differing natural fluoride levels, city budgets allocated for water treatment, and populations of citizens under the age of 14.

Dan: The number of young citizens is particularly important because children see the greatest benefit to dental hygiene from fluoridation with little to no risk.

Kane: I still don't understand how this works, Dan. Why would a dangerous chemical like fluoride protect teeth?

Dan: Again, consider that we chlorinate water at safe levels to protect us from harmful microorganisms. Fluoride is an element that can replace hydroxide ions in tooth enamel resulting in a molecular structure less susceptible to common acidic reactions that occur in the mouth.

Mayor: Selected data for College Station will be shared at this juncture of the meeting. Keep in mind the *minimum* threshold of fluoride recommended by experts is 0.7 mg/L.

College Station	Natural Fluoride	Water Treatment Budget Allocation	Under 14 Population
	0.5 mg/L	5.7%	8,000 of 68,000

Kane: Mayor, our discussion has ignored the concerns of biochemists. I worry we are rushing through this issue haphazardly. Some scientists in the past have communicated directly with the public to deliver what we need to know to make decisions.



Charlie: Kane, I assure you and all of College Station's citizens that we are considering the most up-to-date, peer reviewed research. Peer review is a crucial step in science for vetting and improving the final papers that are accepted. When scientists bypass peer review and appeal directly to the public, we must be cautious of the work as this is a red flag associated with pseudoscientific efforts.

In court proceedings, witnesses' and experts' testimonies are subjected to cross examination. Think of peer review of scientific work as an extremely rigorous form of cross examination by a diverse group of authentic experts. If scientific work was not vetted by a rigorous peer review process, and instead released directly to the public, how would that hinder the trustworthiness of that work?

Kane: But I have information here from the National Health Federation that doesn't seem to support fluoridation. How do you explain that?

Charlie: The National Health Federation may sound official, but the United States Food and Drug Administration referred to it as a “front for promoters of unproven remedies, eccentric theories, and quackery” (as cited in McNeil, 1985). Unfortunately, use of official sounding organizations to put forth the illusion of widespread scientific support is a common pseudoscience tactic. You need to look to organizations that have a long track record of providing credible scientific information.



How can the release of information from an organization purporting to be part of the scientific community create the illusion that a controversy exists regarding a scientific issue?

Mayor: There certainly is no shortage of information from all sorts of sources. At the end of the day, we need to make a decision that we consider to be best for the community's stakeholders. Following our initial research and considering the values shared throughout this preliminary discussion, members of the committee should be narrowing their recommendations. Thank you all for the meeting.

Using the information from the case study and other credible sources (e.g., your course content) answer the following questions.

How might the features of misinformation and disinformation associated with water fluoridation impact peoples' thinking and decision-making?

How might personal and group-reinforced emotions and biases influence thinking and decision-making regarding this issue?

Regulating your own emotions and personal biases and citing multiple lines of credible evidence (scientific, economic) as well as ethical and social considerations, propose a resolution regarding water fluoridation in College Station.

RED FLAG GLOSSARY



Promoting conspiracy theories

Reference to conspiracy theories is an often-used misinformation/disinformation tactic in an attempt to explain why pseudoscientific ideas and/or articles have not been accepted by the scientific community and/or published in scholarly journals, or why the global community of scientists has adopted the consensus position.



Avoiding peer review

During the peer review process, experts in the relevant field rigorously scrutinize the research and conclusions described by the authors. This critical step in science improves the final papers that are accepted, and reduces the number of errant, trivial, irrelevant, or otherwise problematic articles that are published. A major red flag of purveyors of misinformation and disinformation therefore is when scientists bypass the peer review process and instead bring their unvetted work directly to the public.



Creating a fake controversy

Pseudoscientific sources often attempt to manufacture a false sense of legitimacy through the formation of scientific sounding organization and dissemination of information from that organization. This can easily lead to confusion, and cause the public to errantly believe that experts are divided on an issue.

References

- McNeil, D. R. (1985). America's longest war: The fight over fluoridation, 1950-. *The Wilson Quarterly* (1976-), 9(3), 140-153.
- [TxOHC] Texas Oral Health Coalition (2022). *Community water fluoridation*. Texas Oral Health Coalition. <https://txohc.org/resources/community-water-fluoridation/>