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THE ISSUE:

FLUORIDATION OF PUBLIC DRINKING WATER

By

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Introduction

Recently, the U.S. Department of Health and Human Services (DHHS) announced that they are lowering the recommended level of fluoride in public drinking water. This decision may initially seem innocuous, but it surprisingly carries a great deal of weight across the country.

The U.S. Environmental Protection Agency (EPA) has been tasked with developing health goals for substances in water, including fluoride, since 1974. Until recently, the maximum EPA-recommended level of fluoride was 4 milligrams per liter (mg/L), and the U.S. Department of Health and Human Services suggested that levels should stay between 0.7 and 1.2 mg/L. Using these federal recommendations, state and local governments are then responsible for deciding whether or not to fluoridate the public drinking water and at what level of concentration.

While the EPA maintains that 4 mg/L is the maximum safe dosage, the DHHS has stated that 0.7, which was the lower end of the recommended spectrum before, should now be the maximum level of fluoride allowed in public water supplies.

And what about those who want the practice of fluoridation to be discontinued altogether? Concerns over the necessity and safety of the process are continuously being raised and discussed. In this Green Paper, we will explore the extensive debate surrounding the fluoridation of public drinking water, as well as the legislative and regulatory background here in Pennsylvania.

Background

Fluoride is a combination of the element fluorine and other minerals. It occurs naturally in surface waters and, in much greater concentration, ground water. In fact, its effects on oral health were discovered when communities in Colorado's Pikes Peak region were consuming groundwater which had concentrations ranging from 2 to 13 mg/L and were simultaneously experiencing both a discoloration of the teeth and a greater resistance to tooth decay.

Scientists at the time reasoned that there was a balance to be struck here. If they could find the level at which teeth became more resilient, but not so much that they became discolored or pitted, they could reduce the prevalence of tooth decay.

Studies were conducted and the level of one part per million was settled on. Not much later, in 1945, it was first introduced into the public drinking water supply of Grand Rapids, Michigan. It did not take long for fluoride to be hailed as a medical miracle, as the rate of tooth decay in areas where it was introduced were cut in half or more. The U.S. Centers for Disease Control and Prevention (CDC) credited it with being one of the ten greatest public health achievements in the 20th century.

In recent years, some people have come forward with doubts regarding the safety, necessity, and ethics behind the practice. Communities across the country, including several locations in Pennsylvania, have even voted to ban public water fluoridation altogether.

Nationally, 13 states and the District of Columbia currently mandate fluoridation of all community water systems (CWS). In Pennsylvania, the cities of Philadelphia, Pittsburgh and Harrisburg all fluoridate their water, and almost 55 percent of all Pennsylvanians receive fluoride treated water, compared to more than 65 percent, or 200 million people, in the United States.

Medical Effects and Implementation

The two original findings associated with fluoride were fluorosis, a medical condition caused by overexposure to fluoride, and a greater resistance to tooth decay. Fluorosis can either be dental or skeletal, and either cosmetic or severe. If fluoride is consumed in high concentrations over a long period of time, fluorosis can cause joint pain and in even more severe cases, ligaments can calcify, causing muscle impairment.

In the U.S., the more common condition is dental fluorosis. Severe dental fluorosis results in the teeth being pitted and discolored, but this accounts for less than one percent of all reported cases. In most cases, the only effect is a slight to moderate discoloration of the teeth, with purely cosmetic effects.

Other studies have been cited that claim a link between fluoride and impaired neurodevelopment, cancer, and many other harmful conditions. However, these studies are often preliminary, and the DHHS and EPA have said that they take these findings into account when making their recommendations on the appropriate levels of fluoride in drinking water. The DHHS had this to say on the subject:

> "The [National Research Council] review focused on potential adverse effects of naturally occurring fluoride at 2–4 mg/L in drinking water; it found no evidence substantial enough to support effects other than severe dental fluorosis at these levels."

The National Cancer Institute posted on their website that in fluoride studies that looked at population trends, as well as studies that analyzed bone tumors, there was no discernable difference made by fluoridated water.

While there is little evidence that fluoride is harmful when introduced into public drinking water at recommended levels, a few other concerns remain. Namely, the effect of fluoridation on tooth decay, or as it is referred to medically, dental caries. While the instances of caries decreased by

more than half when fluoride was first implemented, people question if it is still necessary today, considering that oral hygiene and health have advanced considerably since the 1940s.

For example, fluoride is present in virtually all toothpaste available today, and personal oral hygiene is more widely practiced. In fact, the practice of fluoridation has been stopped in many other developed countries, but the general downward trend of dental caries in both fluoridated and non-fluoridated countries reveals that there is a different variable effecting the prevalence of this disease. Most likely, it is the spread of information concerning dental health, as well as the introduction of fluoride into toothpaste and other topical treatments like mouth rinse.

Despite this, public health officials say that maintaining a low level of fluoride in the mouth by drinking tap water or eating food prepared with it is still the most cost-effective way to ensure oral health for the entire population. Not all people have access to dentists, products containing fluoride, or to education on the importance of oral hygiene. As an example of this, a study conducted in Oregon in 2007 showed that children from low income families are twice as likely to have tooth decay. This demographic is one of the main targets for fluoridation programs.

The Centers for Disease Control and Prevention conducted a study in Colorado in 2005 to determine the cost savings between fluoridated and non-fluoridated communities. They weighed both the cost to each individual person, as well as the cost to the community as a whole. Per capita, they estimated savings of $60, both in terms of average dental restoration avoided, as well as productivity lost to have the procedure done. For the state as a whole, they estimated a savings of $149 million per year. Compared to the estimated $0.50 to $5.40 cost to fluoridate one person's water for a year, these are significant savings.

The study advocates fluoridating more public water systems as a way to further reduce tooth decay and to further increase savings. However, this study does acknowledge that the savings generated by fluoridation of tap water diminish as more sources of fluoride become available. Although, currently there is approximately 30 percent less tooth decay in communities with fluoride in their drinking water.

Some critics say that this mentality of involuntary preventative care is a form of mass medication and government overreach. They find this to be a violation of their freedom of choice. They believe that the job of community water systems is to provide safe and clean drinking water, not to treat disease.

Statewide Snapshot

Pennsylvania does not mandate fluoride at the state level. Instead, local governments are given the freedom to make that decision. Several townships, cities, and boroughs across the Commonwealth have also discontinued fluoridation. The largest of these has been Bucks County Water and Sewer Authority (BCWSA), which serves 385,000 residents.

There have been a few attempts to pass legislation in the General Assembly to mandate fluoridation statewide. In 2009, Representative Stephen Barrar (R-Delaware) introduced House Bill 584, P.N. 641. This bill would have required any public water supplier who serviced at least 500 domestic water connections to keep the fluoride content of the water between 0.7 and 1.2 mg/L, which was the DHHS's previously-recommended level.

Two months later, House Bill 1382, P.N. 1695 was introduced, sponsored by Representative Eugene DePasquale (D-York). This bill mirrored Representative Barrar's bill, however, it added a section that would allow the public water suppliers to recover the costs associated with fluoridation from the water utility customers.

Both were referred to the Pennsylvania House Health and Human Services Committee and were never moved to the floor for a vote. With no other legislation introduced since the 2009-10 Legislative Session, the decision to fluoridate public water continues to be decided at the local level.

Despite the lack of legislation in the General Assembly, and the decision by certain communities to discontinue fluoridation, the end of the debate is far from decided. Since the 1940s, when fluoridation began, has there been significant disagreement on the practice.

Local Measures

The process for a community to receive fluoridated water differs from each authority and CWS. Authorities can be consecutive or nonconsecutive, meaning that they receive their water from a separate provider, or treat it themselves, respectively. The relationship between these actors can be different depending on the county, city or borough.

For example, the Philadelphia Water Department, which delivers water to 1.6 million residents, fluoridates their water. However, the Department cannot decide on their own to either decrease or eliminate the fluoride that they add. This is because Philadelphia's city code mandates that they keep it at certain levels. Currently, it is at the new recommended level of 0.7 mg/L. They cite the support for fluoridation from respected organizations like the American Dental Association, the World Health Organization, among others.

When Bucks County, on the other hand, voted to receive non-fluoridated water, it was a different process. Firstly, BCWSA is a consecutive authority, which means that they purchase their water supplies from a provider, and do not treat it themselves. Previously, the county purchased water that was treated in Philadelphia. As stated before, the Philadelphia Water Department fluoridates their water. After receiving feedback from the community, the BCWSA switched providers to the Forest Park Water Plant in Chalfont, which already had authorization from the DEP to deliver non-fluoridated water.

Brackenridge Borough was one of the communities that has more recently considered changing their water treatment practices. They are a non-consecutive system, which means that they operate and treat their own wells and water treatment plants. They stated that their main concern was for the safety of the employees who had to handle the fluoride before it is diluted into the water. They also cited the approximately $4,000 per year that it costs to service roughly 6,000 people.

Since then, the borough's water department has decided to continue fluoridation and will wait for future decisions. Notably, the Brackenridge Borough Water Department also provides water to its neighbor communities of Fawn and Harrison. According to the water department, they would have a say if the department were to consider changing their water treatment methods.

For consecutive water systems, unlike Brackenridge Borough, there are physical limitations to switching providers. While some communities have the pipeline infrastructure to switch between

providers, this is not always the case. This can potentially make changing water treatment methods very costly.

As for the DEP's role in these decisions, if a CWS decides to reduce the amount of fluoride, this only requires a minor amendment to their permit if the new amount is still within the department's recommended levels.

However, if a CWS wants to discontinue it altogether, this is a "major permit amendment," and additional steps must be taken. The main concern here is notifying the public of the change. In the case of the BCWSA, they simply began to purchase their water from a different facility which was already allowed through permit to leave their water un-fluoridated.

Along the same lines, if a CWS wants to start fluoridating, they must submit an application for a permit, which demands proof of public notification and an inspection of the equipment and facilities.

Fluoridation Trends in Pennsylvania

Despite the heated debate around the issue of public water fluoridation, there is surprisingly sparse data on trends in Pennsylvania. The DEP's Bureau of Safe Drinking Water retains data on how many CWSs have permits to fluoridate, and how many people they serve. However, these numbers only go back to 1995, and there are gaps where no data is available at all. For example, there is no data for the years 1999 until 2002. And this is not due to negligence on the part of the Bureau. In fact, there is no legislative mandate for them to collect statewide fluoridation data in the first place.

The fluoride landscape is one that is constantly shifting in the Commonwealth, as it is something that communities can change themselves. And unless legislation is passed, it will continue to be flexible. Considering the amount of work conducted nationwide in terms of analyzing the effects of fluoride, understanding not only the current distribution, but also knowing what it looked like in the past is key to accurate, meaningful research. Research which will then inform scientists, health officials, policy makers and consumers.

While fluctuations in the number of CWSs fluoridating do not relay data on how effective or safe fluoride is on its own, many studies rely on this data to analyze trends. The CDC, for example, displays data on the rates of tooth decay alongside rates of fluoridation. Without accurate data, false correlations can be drawn. In order for stakeholders to make informed decisions about water treatment, longitudinal data on who receives fluoride is vital.

Fortunately, data collection and retention has improved in recent years. In 2006, the EPA implemented the Long Term Two Enhanced Surface Water Treatment Rule, which was mostly geared toward the disinfection of public drinking water, however it also demanded that systems monitor and classify how they treat their water. Similar requirements were introduced with the Stage Two Disinfectants and Disinfection Byproducts Rule. These rules are one of the main reasons that systematic and reliable data on fluoridation exists today in Pennsylvania.

The Bureau of Safe Drinking Water's data is actually referenced by the U.S. Department of Health and CDC. In terms of Pennsylvania-specific numbers, the Bureau seems to be the only organization collecting original data.

From the data that is available, it is shown that the number of CWSs that fluoridate is still changing. Ten systems have discontinued fluoridation since 2011, which accounts for 200,000 Pennsylvanians. But what is driving movement towards or away from this practice if there is no body of long term data available on the topic?

Perhaps having more data collected and available will not make the issue disappear, but both citizens and policy makers will continue to form opinions. In order to assure that these opinions have a solid foundation in fact, fluoridation rates should be documented.

Conclusions and Recommendations

The practice of fluoridation is one that has always been controversial, and many questions remain. Are the health benefits enough to offset the perceived dangers? Is it ethical to put a non-essential medication in the public's drinking water? What would the costs of non-fluoridated water be? These are important questions for communities, individuals and governments alike.

Much of the difficulty surrounding this issue stems from the onslaught of sensationalist and biased sources. For consumers and stakeholders alike, it is made more confusing when there is no readily available database to affirm or dispute unscientific or misleading sources.

This is not to say that there is no trustworthy information on fluoride available. Data is collected at the federal level and in other states, and for the medical implications, these are valuable regardless of what state a person lives in. However, there are tremendous social and economic implications right here in our own Commonwealth that we cannot draw conclusions from without our own data. While what the Bureau of Safe Drinking water has available seems to be moving in the right direction, this issue should have enough traction to warrant closer study and monitoring.

The battle over fluoridation is one of the longest continuous debates in both Pennsylvania and the country. It has gained and lost traction over the years, but it not likely to become any less divisive or controversial. In the meantime, collecting and providing factual data about fluoride in Pennsylvania is key to making responsible decisions about our water in the future.

Editor's Note

Green Papers are issued periodically be the Joint Legislative Air and Water Pollution Control and Conservation Committee staff. As indicated by the subtitle, each Green Paper is a monograph on a specific environmental issue that has come to the attention of, or is currently being dealt with, by the Committee. Each Green Paper is intended to provide a more in depth look at specific issues than normally permitted by other Committee publications, such as the Committee's monthly newsletter, the Environmental Synopsis.

The Joint Conservation Committee is a bipartisan committee consisting of 18 members of the House and Senate which conducts studies, holds hearings and makes recommendations to the General Assembly on a variety of issues related to the sustainable use of Pennsylvania's diverse natural resources. Recent issues that the Committee has focused on include natural gas pipelines and the economic and environmental impacts of natural gas.

For more information about the committee, or to be added to the mailing list for future Green Papers and the Environmental Synopsis, please contact the Committee office at (717)787-7570.