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FAN Special Report

FLUORIDATION: WORSENING THE LEAD CRISIS IN FLINT, AND BEYOND

By Michael Connett | February 10, 2016

Introduction

Over the past few weeks, the nation has watched in horror at the lead poisoning crisis unfolding in Flint, Michigan.

The details from Flint have been shocking: tap water so corrosive it caused lead levels in some homes to meet the classification for hazardous waste; and politics so corrosive that "while the children in Flint were drinking lead-filled water, there was one — and only one — address in Flint that got clean water: the GM factory."

Lead is a powerful neurotoxin, one that causes irreversible damage to the developing brain. The damage manifests in reduced IQs, behavioral problems, and violent behavior. But lead is not the only neurotoxin that Flint children are now ingesting in their tap water.

Like most other urban areas in the United States, Flint adds a corrosive fluoride chemical to its water in the name of preventing tooth decay (aka "water fluoridation"). This fluoride chemical is not only a neurotoxin, its repeatedly been found to leach lead from water pipes and increase the levels of lead in children's blood.

In short, fluoridation programs are adding fuel to the fire of America's lead crisis, in Flint and beyond.

Flint Is the "Tip of the Iceberg"

The staggering risks from lead poisoning extend far beyond the borders of Flint. In the words of one scientist, "Flint is the tip of the iceberg."

In fact, many cities across the United States have "higher rates of lead poisoning" than Flint, including at least 6 other (fluoridated) cities in Michigan itself.

As in Flint, tap water can be a major source of lead exposure, despite debunked claims to the contrary by some public health agencies, including the Centers for Disease Control.

Although lead water pipes were banned in 1986, millions of Americans still drink tap water that travails through lead service pipes and many millions more drink water that passes through lead-containing brass fixtures — all with a complex brew of corrosive water treatment chemicals, including chlorine, chloramines, and fluorosilicic acid.

Clean water activist Erin Brockovich stated recently that the U.S. is facing a "national water crisis." Fluoridation is contributing to that crisis.

Fluorosilicic What?

Fluorosilicic acid (FSA) is a corrosive fluoride chemical captured in the emission scrubbers of the phosphate industry that many urban areas in the U.S., including Flint, add to their water in an attempt to prevent tooth decay.

Several lines of evidence suggest that FSA-spiked water is contributing to unsafe lead exposures in children.

To be clear, Flint's lead problem was primarily caused by the decision in April 2014 to obtain drinking water from the corrosive, chloride-laden Flint River, which was further compounded by the city's inexcusable failure to add anti-corrosives to this water. These two factors were sufficient to create a major corrosion problem in Flint's aging pipes, even without fluoridation.

Fluoridation, however, may be making the problem worse.

Fluoridation Increases the Acidity of Water

Some of the first indications that FSA could leach lead into water came in the early 1990s when water departments in Maryland and Washington noticed significant drops in water lead levels immediately after terminating their fluoridation programs.

More recently, water departments have confirmed that the addition of FSA can increase the acidity of water, which in turn makes the water more corrosive.

In San Francisco, water treatment engineers found that the addition of FSA to the city's soft water reduced the pH from 9 to less than 7.5. (Wilczak 2010) Because of this, San Francisco added additional caustic soda to the water to bring the pH back to non-corrosive levels.

Similarly, in Thunder Bay, Canada, the addition of FSA was found to reduce the pH of the city's soft water (from 7.54 to 7.27), nearly tripling the rate of lead leaching from pipes.

> "The Thunder Bay drinking water is corrosive by nature. Addition of fluoridating agents to the water, especially fluorosilicic acid would increase this tendency and hence increase lead levels at the consumer tap. The use of an anti-corrosion agent, such as sodium hydroxide as demonstrated in this experiment, would be needed to counteract this effect." (Vukmanich 2009)

The Thunder Bay and San Francisco experiments highlight the hazards of adding FSA to water, particularly soft water, where there is no offsetting attempt to increase the pH. **This is what happened in Flint.**

Although Flint's water is not as soft as Thunder Bay or San Francisco, documents released by Flint's water treatment plant confirm that the pH of Flint's tap water declined during the period when anti-corrosives were not added. As reported by Michigan Public Radio, "Data available online from the City of Flint show that the pH of treated water leaving the plant has been trending downward – becoming more acidic."

In December 2014, the average pH of treated water was 8.04; by August of

2015, the average pH of treated water was just 7.34. In most instances, the pH of the treated water was less than the pre-treated water, thus suggesting that some component(s) of the water treatment process was responsible for the increase in acidity. FSA may have been one of the factors contributing to the acidification of Flint's water.

Fluoridation Can Leach Lead from Pipes, Even in Non-Acidic Water

Even if fluoridation did not reduce the pH of Flint's water, it could still have contributed to Flint's lead crisis. As explained by scientists from the University of North Carolina, FSA "does not leach lead simply because it is an acid." (Maas, et al. 2007). FSA may also leach lead due to its "unique affinity for lead."

In carefully controlled laboratory experiments, the North Carolina scientists found that FSA can increase the leaching of lead in non-acidic waters (pH = 8), even from common brass fixtures, like faucets, that contain small quantities of lead. (Maas 2007)

The scientists found that combinations of FSA and chlorinated disinfectants can produce more severe effects than the chemicals by themselves, sometimes dramatically so.

In one experiment, the combination of FSA and chlorine caused lead levels to spike as high as 1,000 ppb, nearly 70 times higher than EPA's action level, while, in another experiment, the joint action of FSA and chloramines produced lead levels to spike as high as 400 ppb, nearly 30 times the EPA action level.

To be clear, the North Carolina study used higher concentrations of FSA than are added to public tap water. The study used about 2 times more FSA than the level historically added to U.S. water supplies, and about 3 times more than the levels generally added today. As a result, the use of FSA for fluoridation programs may not produce as dramatic an effect as the North Carolina team observed.

The North Carolina study's findings do demonstrate, however, that — despite theoretical arguments to the contrary — highly diluted levels of FSA can leach lead from pipes and common brass fixtures, even in pH-adjusted water, and this effect can be unpredictably amplified in the presence of other common water treatment chemicals.

FSA Linked to Elevated Blood Lead Levels in Children

So, FSA can leach lead from pipes in laboratory experiments. This is now clear. But what about in real world conditions: can FSA contribute to measurable increases in our lead exposure?

The first two studies to investigate this issue analyzed the blood lead levels of almost 400,000 children living in areas with and without fluoridated water in New York and Massachusetts . (Masters 1999, 2000). These studies found that children living in areas with FSA-treated water were at increased risk of having markedly elevated blood levels (>10 ug/dl).

These studies, conducted by Dartmouth professor Roger Masters and chemical engineer Myron Coplan, sent shock waves through the public health community. As Masters noted, "If further research confirms our findings, this may well be the worst environmental poison since leaded gasoline."

Even the CDC has conceded that, if research confirms the link between fluoridation and elevated lead exposure, fluoridation would need to end, noting that "efforts to prevent dental caries via the use of fluoridated drinking water should continue **unless** a causal impact of certain fluoridation methods on PbB [blood lead] concentration is demonstrated by additional research." (Macek 2006)

This brings us to CDC's own study on the issue.

After criticizing the methodology of Masters and Coplan's studies, the CDC published an analysis of a smaller sample of 10,000 children from across the country, whose blood was measured for lead during the 1988-1994 National Health and Nutrition Examination Survey. (Macek 2006).

The CDC study — which controlled for the key factors known to influence blood lead levels, including race/ethnicity, poverty status, and urbanicity — is sometimes touted as refuting the link between fluoridation and lead hazards, but a close look at its data shows that the study does little to dampen concern.

According to the CDC's data, FSA was associated with an elevated risk for high blood lead (> 5 ug/dl) **in every single category of children identified by the CDC**, even after controlling for the other key risk factors. FSA was associated with

- **a 20% increased risk** (but not statistically significant) for high blood lead levels among children living in houses made prior to 1946;
- **a 40% increased risk** (but not statistically significant) for high blood lead levels among children living in houses made between 1946 and 1973;
- **a 70% increased risk** (but not statistically significant) for high blood lead levels among children living in houses made after 1974;
- **a 530% increased risk** (which was statistically significant) for high blood lead levels among children living in houses with unknown ages.

Since most of these elevated risks were not statistically significant, the CDC dismissed them as essentially a random fluke. However, the consistency in the direction of the risk, coupled with the statistically significant 530% increased risk for children in homes of unknown age, raises a serious red flag.

Even the CDC has acknowledged that the study does not refute the connection between fluoridation and lead, and that "it is possible that larger samples might have identified additional, significant differences."

In fact, when Coplan and the North Carolina team re-analyzed CDC's data by placing all children exposed to FSA and sodium fluorosilicate in one group ("silicofluorides"), and all other children in another, they found that the children exposed to silicofluoridated water had a significantly elevated risk of having high blood lead levels. (Coplan 2007)

According to Coplan's re-analysis, children from the silicofluoridated communities had a 20% greater risk of having blood lead levels in excess of 5 ug/dl. Coplan's team estimated that the risk for exceeding the 10 ug/dl threshold would be even greater.

Fluoride Can Increase the Uptake & Toxicity of Lead

In addition to leaching lead from water pipes, animal studies have found that fluorides increase the risk of lead poisoning by facilitating the uptake of lead into the blood, and intensifying lead's effects on the body, including the brain.

In the 1970s, US government scientists from the National Institutes of Health (NIH) and Food & Drug Administration (FDA) quietly reported that rats exposed to lead and sodium fluoride accumulate far higher

concentrations of lead in their blood and bone than rats who are only exposed to lead.

Not only that, the NIH/FDA team reported that **"the combination of Pb and F was much more severely toxic than either compound alone."** (Mahaffey 1976) At the time this study was conducted, lead was still being purposely added to gasoline, and millions of Americans were already drinking fluoridated water.

Despite the study's potentially huge public health implications, the FDA and NIH kept mum. Other than a short abstract in an obscure journal, the study was never published and there is no record of either the FDA or NIH following up with further research.

The issue remained completely off the radar for three decades until–in the wake of Masters and Coplan's studies–the CDC recommended that "studies of animal toxicology" be conducted to investigate fluoride's interactions with lead. (Macek 2006)

Shortly after CDC's recommendation, a Brazilian team led by Dr. Raquel Gerlach published a paper that corroborated a key part of the buried FDA/NIH study. Gerlach's team confirmed that:

> "[C]o-exposure to fluoride and lead from the beginning of gestation consistently increases the concentrations of lead in whole blood and in calcified tissues . . . . Lead concentrations were found to be 2.5 times higher in the superficial enamel, 3 times higher in surface bone, 2 times higher in whole bone, and 1.7 times higher in the dentine when the animals were co-exposed to fluoride, thus indicating a consistent rise in the amounts of lead found in whole blood and calcified tissues in the F + Pb Group." (Sawan 2010)

As the NIH/FDA team likely understood back in the 1970s, these findings "have serious implications for populations exposed to increased amounts of both lead and fluoride, particularly young children." As Gerlach's team explained:

> "it is likely that young children may experience episodes of exposure to high levels of fluoride, which may cause their BPb levels to increase and produce more lead toxicity." (Sawan 2010)

In a follow-up study, Gerlach's team reported a further twist: Not only does fluoride increase the uptake of lead into blood, but lead magnifies fluoride's damaging effects on teeth, causing a greater incidence and severity of dental fluorosis – which may help explain why the burden of dental fluorosis disproportionately impacts the heavily lead-exposed black community. (Leite 2011)

Effects on teeth, however, are not the main concern. As noted earlier, both lead and fluoride are neurotoxins that can damage the developing brain. Could the combined exposure to both be causing a worse effect than either one alone? Recent animal experiments suggest the answer is yes. (Niu 2009, 2014, 2015)

But don't expect warnings anytime soon from public health authorities. As with lead in water, health authorities at the local, state, and federal levels have been extremely slow to address the risks — and lack of benefits — of the nation's floundering fluoridation program.

While health authorities continue to dodge the issue, water consumers would be well advised to begin taking measures to minimize their fluoride intake, starting with the fluoride chemicals pouring through America's lead-contaminated water infrastructure.

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