Beyond Flint: Why Your Drinking Water May Be Worse

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National Capital Region Campus
Falls Church, VA

Center for Health, Environment & Justice
Training Conference Call • March 21, 2017
“...water ought by no means to be conducted in lead pipes, if we want to have it wholesome.”

Vitruvius (80-70 BC – c. 15 BC), Roman author, architect, and engineer, in *De Architectura*, Book VIII

“...lead makes the mind give way.”

Dioscorides (40-90 AD), Greek physician, in *De Materia Medica*
“Lead concealed in the walls and under the floors of many modern buildings helps to give **the best sanitation**.”

“Lead, therefore, is contributing to the **health, comfort and convenience** of people today as it did when Rome was a center of civilization.”

National Geographic, 1923
The diagram illustrates the components of a typical residential water system. The lead service line, which was banned in 1986, is shown leading from the curb box to the water meter. The leaded solder, which was also banned in 1986, is indicated at certain points in the water main. The leaded brass, galvanized iron/steel, and water main are also labeled in the diagram.
<table>
<thead>
<tr>
<th>Plumbing material</th>
<th>US homes affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaded brass</td>
<td>Almost all</td>
</tr>
<tr>
<td>Lead solder</td>
<td>Approx. 81 million</td>
</tr>
<tr>
<td>Lead service lines/goosenecks/pipes</td>
<td>6-10+ million</td>
</tr>
</tbody>
</table>

Marc Edwards, presentation to NDWAC LCR WG, 9/9/2014

<table>
<thead>
<tr>
<th>Year</th>
<th>Definition of “lead free”</th>
</tr>
</thead>
</table>
| 1986 | **Solder and flux:** ≤ 0.2% lead  
      | **Pipes and pipe fittings:** ≤ 8% lead |
| 2014 | **Solder and flux:** ≤ 0.2% lead  
      | **Pipes and pipe fittings:** weighted average of 0.25% lead as determined by the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures |
Lead dose in one glass of water exceeding the US Consumer Product Safety Commission “acute health threat” for lead 71 times.

Image sources: https://www.sciencedaily.com/releases/2006/06/060630095556.htm; courtesy of Dr. Marc Edwards, Department of Civil and Environmental Engineering, Virginia Tech.

Food cooked with tap water containing lead particles collected from the home of a lead-poisoned child contained more lead than a lead paint chip approximately the size of a penny.
# Lead in Water: EPA Standards

<table>
<thead>
<tr>
<th>Source</th>
<th>Lead (ppb)</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPA LCR</td>
<td>0</td>
<td>Health standard</td>
</tr>
<tr>
<td>EPA LCR</td>
<td>15</td>
<td>Lead action level</td>
</tr>
<tr>
<td>EPA</td>
<td>40</td>
<td>“Imminent and substantial endangerment”</td>
</tr>
</tbody>
</table>
Lead in Water: the Lead and Copper Rule

Monitor at consumer taps to capture worst-case lead levels at highest risk homes

Treat water to minimize lead at consumer taps
≤10% over lead action level

Remedial action NOT required
Lead and Copper Compliance Report
July through December 2015

Table 1 summarizes the District of Columbia Water and Sewer Authority’s (DC Water) Lead and Copper compliance results for the monitoring period July through December 2015.

Table 1. Lead and Copper Summary Data

<table>
<thead>
<tr>
<th>Number of Samples</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead and Copper</td>
<td>110</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>90th Percentile First Draw Concentrations</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead mg/L</td>
<td>0.004</td>
</tr>
<tr>
<td>Copper mg/L</td>
<td>0.086</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Service Line Materials</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Lead</td>
<td>77%</td>
</tr>
<tr>
<td>Partial Lead</td>
<td>23%</td>
</tr>
<tr>
<td></td>
<td>Address</td>
</tr>
<tr>
<td>----</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>99</td>
<td>5234 Illinois Ave NW</td>
</tr>
<tr>
<td>100</td>
<td>1529 27TH ST NW</td>
</tr>
<tr>
<td>101</td>
<td>8 N St SW</td>
</tr>
<tr>
<td>102</td>
<td>1513 27TH ST NW</td>
</tr>
<tr>
<td>103</td>
<td>4525 15TH ST NW</td>
</tr>
<tr>
<td>104</td>
<td>2719 O ST NW</td>
</tr>
<tr>
<td>105</td>
<td>1020 INDEPENDENCE AVE SE</td>
</tr>
<tr>
<td>106</td>
<td>125 Madison St NW</td>
</tr>
<tr>
<td>107</td>
<td>4703 Macarthur Blvd NW</td>
</tr>
<tr>
<td>108</td>
<td>314 VARNUM ST NW</td>
</tr>
<tr>
<td>109</td>
<td>702 9th St SE</td>
</tr>
<tr>
<td>110</td>
<td>5731 3rd Pl NW</td>
</tr>
</tbody>
</table>
>10% over lead action level

Remedial action **required**

- Source water treatment
- CC treatment (re-)optimization
- Public education
- LSL replacement
2011 CDC study


Washington, DC

- **Partial LSLR**
  - 2x vs. **Intact LSL**
  - 4x vs. **No LSL**
“Shared Responsibility” Regime

Water Utilities
required to prevent citywide contamination

PUBLIC EDUCATION

Consumers
expected to take appropriate precautions
1. Lead release tends to be variable

<table>
<thead>
<tr>
<th>Example factors influencing corrosion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age/integrity/metals content of plumbing</td>
</tr>
<tr>
<td>Water chemistry</td>
</tr>
<tr>
<td>Water temperature</td>
</tr>
<tr>
<td>Frequency of water use/duration of stagnation</td>
</tr>
<tr>
<td>Water flow (high/low)</td>
</tr>
<tr>
<td>Outside temperature</td>
</tr>
</tbody>
</table>
2. Lead particles create “Russian roulette” phenomenon
3. **Standard sampling method misses worst-case lead in LSL homes/buildings**
4. **Water utilities often take steps known to miss lead**

### Gaming examples

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Flush pipes the night before sampling</td>
<td></td>
</tr>
<tr>
<td>Remove &amp; clean aerator</td>
<td></td>
</tr>
<tr>
<td>Limit stagnation time to 6-8 (or 12) hours</td>
<td></td>
</tr>
<tr>
<td>Use small-moutheled bottles</td>
<td></td>
</tr>
<tr>
<td>Target non-high-risk homes</td>
<td></td>
</tr>
</tbody>
</table>
US authorities distorting tests to downplay lead content of water

Exclusive: Documents seen by the Guardian reveal questionable practices that mean people's drinking water is at risk in 'every major city east of the Mississippi'

Oliver Milman in New York

Friday 22 January 2016 13.57 EST

US authorities distorting tests to downplay lead content of water

Exclusive: Documents seen by the Guardian reveal questionable practices that mean people's drinking water is at risk in 'every major city east of the Mississippi'

Oliver Milman and Jessica Glenza

Thursday 2 June 2016 07.03 EDT

Lead Levels in Water Misrepresented Across U.S.
Utilities Manipulate or Withhold Test Results to Ward Off Regulators

By Carol D. Leonnig, Jo Becker and David Nakamura
Washington Post Staff Writers

Tuesday, October 5, 2004; Page A01
Lead in Drinking Water: EPA letters

• Do not flush the night before sampling
• Do not remove & clean aerators prior to sampling
• Do not cap stagnation time
• Use wide-mouthed bottles that allow for normal-use flow
• Target high-risk homes for lead in water
Lead in Drinking Water: Remaining Problems

• Variability in lead release
lead particle
Lead in Drinking Water: Remaining Problems

• Variability in lead release
• New “lead free” plumbing
School Testing Results
The school testing results show the results from water testing done in Flint schools.

Flint Community Schools Initial Screening Results (Oct. 2)

**Pre-Fixture Replacement**
- Administration Building Report with Lead and Copper Results
- Brownell STEM Academy Report with Lead and Copper Results
- Doyle/Ryder Elementary Report with Lead and Copper Results
- Durant Tuuri Mott Elementary Report with Lead and Copper Results

**Post-Fixture Replacement**
- Cathedral of Faith Head Start
- Eagles Nest Academy
- Flint Community Schools, Central Kitchen
- Flint Institute of Music
- Flint Public Schools, Administration Building
- Flint Youth Theater

**Post-Filter Installation**
- Brownell STEM Academy
- Cummings/Great Expectations Daycare
- Doyle Ryder Elementary School
- Durant Tuuri Mott
- Eisenhower School
- Freeman Elementary School
- Holmes STEM Academy
Flint resident Ronda Thornton’s lead-in-water results 3 days after her faucet was replaced, Feb. 2017

<table>
<thead>
<tr>
<th>Metal</th>
<th>Result in Parts Per Billion (ppb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper 250 mL Sample</td>
<td>Not detected</td>
</tr>
<tr>
<td>Copper 750 mL Sample</td>
<td>100</td>
</tr>
<tr>
<td>Copper Calculated to 1L</td>
<td>80</td>
</tr>
<tr>
<td>Lead 250 mL Sample</td>
<td>8</td>
</tr>
<tr>
<td>Lead 750 mL Sample</td>
<td>22</td>
</tr>
<tr>
<td>Lead Calculated to 1L</td>
<td>46</td>
</tr>
</tbody>
</table>

What the Results Mean: The result tells you how much lead and copper is in the water.
- If the result for Copper is “Not Detected”, that means the amount of copper in the water was less than 50 ppb.
- If the result for Lead is “Not Detected”, that means the amount of lead in the water was less than 1 ppb.

If you used the new two bottle kit you will see three sets of results:
- You will have a lead and copper result for the 250 ml sample (Bottle #1)
- You will have a lead and copper result for the 750 ml sample (Bottle #2)
- You will also have a calculated result. This number shows what the result would have been if you had used a one liter sample bottle. This is useful so that you can compare this report to previous samples that you have submitted.

No matter what your lead result is, you should continue to use an NSF certified filter until the Public Health Emergency Declaration has been lifted.

For more information go to: www.mi.gov/flintwater or call 800-662-9278

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<thead>
<tr>
<th>Metal</th>
<th>Result in Parts Per Billion (ppb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper 250 mL Sample</td>
<td>230</td>
</tr>
<tr>
<td>Copper 750 mL Sample</td>
<td>50</td>
</tr>
<tr>
<td>Copper Calculated to 1L</td>
<td>100</td>
</tr>
<tr>
<td>Lead 250 mL Sample</td>
<td>126</td>
</tr>
<tr>
<td>Lead 750 mL Sample</td>
<td>19</td>
</tr>
<tr>
<td>Lead Calculated to 1L</td>
<td>46</td>
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### Kitchen

### Bathroom
Lead in Drinking Water: Remaining Problems

• Variability in lead release
• New “lead free” plumbing
• Sampling protocol that misses LSL lead
## Evaluated Three Potential LT-LCR Tap Sampling Requirements to Identify Impacted Systems

<table>
<thead>
<tr>
<th>Scenario No.</th>
<th>Description</th>
<th>Percent of Systems Above AL with LT-LCR Changes</th>
<th>Population Impacted (in Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Changing sample site Tier Definition – Tier 1 Sites Served by a LSL</td>
<td>12.5% of systems with LSLs</td>
<td>15.2</td>
</tr>
<tr>
<td>2</td>
<td>Sampling Directly from LSLs – Temperature Variation Method</td>
<td>9.5% of systems with LSLs</td>
<td>11.8</td>
</tr>
<tr>
<td></td>
<td><strong>Sampling Directly from LSLs – Standard Volume Flushing Method</strong></td>
<td><strong>54.5% of systems with LSLs</strong></td>
<td><strong>74.0</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Sampling Directly from LSLs – Sequential Sampling Method</strong></td>
<td><strong>70.5% of systems with LSLs</strong></td>
<td><strong>96.4</strong></td>
</tr>
<tr>
<td>3</td>
<td>Targeted Cu Monitoring</td>
<td>8% of systems with high alkalinity and low pH</td>
<td>10.9</td>
</tr>
</tbody>
</table>

54.5-70.5% of systems would exceed the LAL

Arcadis/AWWA WQTC 2014 survey of LSLs
Lead in Drinking Water: Remaining Problems

- Variability in lead release
- New “lead free” plumbing
- Sampling protocol that misses LSL lead
- EPA National Drinking Water Advisory Council (NDWAC) recommendations
NDWAC Recommendations

EPA NATIONAL DRINKING WATER ADVISORY COUNCIL

December 15, 2015

NDWAC Members

Jill D. Jonas, Chair
Madison, WI

William A. Bly
San Diego, CA

Jeannine Marie Bruno
Dunwoody, GA

Marilyn Christian
Round Rock, TX

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Davenport, IA

Howard Neufang
Philadelphia, PA

Sarah Pilut
Concord, NH

Mark S. Sanchez
Albuquerque, NM

Chris L. Wiant
Denver, CO

Ms. Gia McCarthy
Administrator
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington D.C. 20460

Dear Administrator McCarthy:

On behalf of the National Drinking Water Advisory Council (NDWAC or Council) and with unanimous agreement, I am pleased to provide recommendations for the long-term revisions to the Lead and Copper Rule (LCR). The eventual long-term revisions to the LCR will be an important opportunity for removing sources of lead in contact with drinking water and thereby reducing exposure to lead from drinking water.

Recognizing that there is no safe blood lead level, revisions to the LCR alone are not sufficient to address this critical issue. A comprehensive shared responsibility exists between federal, state and local government, public and private utilities, and customers. With other partners such as the Housing and Urban Development (HUD), the Environmental Protection Agency (EPA or Agency) should lead a comprehensive collaborative national effort to reduce lead in drinking water.

The removal of all lead service lines will require significant financial resources and time. During this time it is essential to have in place a robust effort of consumer education and engagement to assure ongoing protection from exposure to lead in drinking water. Also, prior to adoption of the new rule the highest level of compliance with the existing rule must occur.

Please allow the Council valued and considered in our deliberations and recommendations all public comments and opinions received.

The following discussion provides historical context and the Council's overarching strategic thoughts about reducing lead in drinking water. Under the Safe Drinking Water Act (SDWA) EPA sets public health goals and enforceable standards for drinking water quality.1 The LCR is a

[1] EPA establishes National Primary Drinking Water Regulation (NPDWR) under SDWA. NPDWRs either establish a feasible Maximum Contaminant Level (MCL) or a treatment technique, to prevent known or anticipated adverse effects on the health of persons to the extent feasible.

Lambrinidou Dissent

parents for nontoxic alternatives

October 28, 2015

To: The EPA National Drinking Water Advisory Council (NDWAC)
Re: Long-term revisions for the Lead and Copper Rule (LCR)

Dear Chair Jonas and members of the Council:

As a dissenting member of the Environmental Protection Agency (EPA) National Drinking Water Advisory Council (NDWAC) Lead and Copper Rule (LCR) working group, I hereby submit to NDWAC and to the official EPA record, my statement of dissent to the August 2015 “Report of the Lead and Copper Rule Working Group to the National Drinking Water Advisory Council.”

I share fully the working group’s commitment to a revised LCR that maximizes the protection of public health. I also commend the working group for its bold and innovative idea of building a brand new rule that is based on proactive, rather than reactive, full lead service line (LSL) replacement. As I mention in my statement, I see this as a step in the right direction. Unfortunately, however, my extensive experience with lead in drinking water in Washington, DC and nationally, has led me to believe that the working group’s specific recommendations for how to implement a forward-thinking LCR would leave consumers less protected from exposures to lead in drinking water than would a revised version of the current rule that closes its well-known loopholes.

Mirroring the structure of the working group’s report, I explain my reasoning in the pages that follow under these four sections:

I. Proactive Full LSL Replacement
II. Public Education for Lead and Lead Service Lines
III. Improved Corrosion Control Treatment
IV. Monitoring Requirements

I would also like to highlight the following three points, in case they prove useful to NDWAC’s deliberations:

• It is sometimes assumed that a concerted effort to protect consumers from lead in drinking water is now necessary solely because science has shown that even small exposures to lead can cause significant health harm, and the Centers for Disease Control and Prevention (CDC) has recently lowered its 10 micrograms per deciliter “blood lead level of concern” to a 5 micrograms per deciliter “reference level.” Although these developments are true, they make for a very incomplete justification for the need to strengthen the LCR at this time. Since the


PO Box 6285 Washington DC 20015 • ph 202.997.1854 • e pollutionnatives@yahoo.com
Lead in Drinking Water: Remaining Problems

- Variability in lead release
- New “lead free” plumbing
- Sampling protocol that misses LSL lead
- EPA National Drinking Water Advisory Council (NDWAC) recommendations
- Schools
Schools *NOT* covered under the LCR (or any other federal regulation)
Lead in Drinking Water: New Paradigm

A BILL

IN THE COUNCIL OF THE DISTRICT OF COLUMBIA

To amend the Healthy Schools Act of 2010 and the Lead-Hazard Prevention and Elimination Act of 2008 to require the environmental programs office in the Department of General Services ("DGS") to locate drinking water sources in public schools and Department of Parks and Recreation ("DPR") facilities; test all drinking water sources in public schools and DPR facilities; and notify District of Columbia Public Schools or the Department of Parks and Recreation about the test results and remediation plan, and post filter information, test results, and remediation efforts online; to require DGS to maintain an online list with information about filters, testing, and maintenance at public schools and DPR facilities; to require, beginning May 1, 2018, public charter schools to locate drinking water sources and install and maintain filters for reducing lead at all drinking water sources in public charter schools, test all designated drinking water sources for lead annually; if water lead concentrations exceed 1 ppb, shut off the drinking water source within 24 hours, make publicly available filter
Thank you!

yanna@vt.edu