Let’s Tackle School Drinking Water Safety!

Webinar 3:
Solutions: Find It and Fix It
— or — Flush or Filter it
Moderator:

Christina Hecht, PhD

Senior Policy Advisor, Nutrition Policy Institute, University of California, Division of Agriculture and Natural Resources
Previous Webinars

Drinking Water and Lead Exposure

Planning for School Water Quality: Steps to Take
We Know ... 

Most water is safe

BUT – Times and places where it is not
Reducing Lead in Tap Water

Assess risk

Minimize exposure

Find solutions
Lindsay McCormick, MPH
Project Manager, Chemicals and Health
Health Program
Environmental Defense Fund
What is the likelihood you’ll have a problem at the tap?
1) Know your pipes and parts
2) Know your service lines
Minimizing Children’s Lead Exposure
Best case: find source and fix it
Keep aerators clean
Use cold water for drinking and cooking
Understand water flow and use

**Flushing**

- DW = drinking water bubbler
- WC = water cooler (chiller unit)
- CF = classroom faucet
- KC = kitchen faucet, cold
- KH = kitchen faucet, hot
- EC = home economics room, cold
- EH = home economics room sink, hot
- BF = bathroom faucet
- NS = nurse's office sink
- SC = service connector
Filtering

- Test water for contaminants
- Select correct filter
  - 42: “Aesthetic Effects” -- e.g., Chlorine, taste, odor
  - 53: “Health Effects” -- e.g., Lead, Cryptosporidium, volatile organic chemicals
- Replace filter in time
- Dispose of filter correctly

Water station with filter box
Boston Latin School, MA

Questions? Contact Katherine Walsh
Boston Public Schools
kwalsh4@bostonpublicschools.org
LSLR Collaborative Resources

Web-based tools and resources to support and accelerate full LSL replacement initiatives

Homepage: lslr-collaborative.org

Child care facilities and schools:
Information ("Tell") ➔ Transparency ➔ Confidence

Findings

• “Here’s what we learned”
  • Numerator
  • Denominator
• We’re doing this because we care

Remediation

• “Here’s what we’re doing about it”
  • When
  • How
  • Who
Rob Christlieb, LEED AP
Senior Manager of Construction
Chicago Public Schools
CPS Lead Testing Overview

About the CPS Testing Program

- Our top priority is the health and safety of our students, staff and community. Testing was initiated out of an abundance of caution to ensure the water in our schools is safe.
- Testing Completed in 2016
- “Five Sequential” testing very helpful in profiling a fixture and the building
  - Leads to understanding of plumbing systems and how they are used
  - Reveals that sometimes lead is coming from farther back in system
  - Allows for the ability to plan, program and allocate resources based on data.
## Testing and Findings

<table>
<thead>
<tr>
<th>TESTS</th>
<th>LEAD LEVEL OVER 15 ppb</th>
</tr>
</thead>
<tbody>
<tr>
<td>526 CPS schools</td>
<td>37% had at least one sample &gt;15ppb</td>
</tr>
<tr>
<td>11,969 taps tested</td>
<td>3.05% had at least one sample &gt; 15ppb</td>
</tr>
<tr>
<td>58,985 samples analyzed</td>
<td>1.37% of samples were &gt;15ppb</td>
</tr>
</tbody>
</table>
Water Sampling Method

- All sources unused (stagnant) for 8-18 hours
- 5 (five) 250mL sequential samples of cold water collected per outlet (total of 1.25 L)
- Sample ONLY food and drinking water sources
- Hired trained samplers
  - Interviewed building engineer or custodial staff for plumbing system information
  - Sampled before school started

Analysis by EPA-certified laboratory
Costs for CPS - 526 Schools

- Total costs for testing = $2.1 million
  - With 58,985 samples, Average = $35/Sample analyzed
  - Includes cost of lab technician to draw each sample

- Total costs for Mitigation & Pilots = $429,000
  - New potable water system for Tanner = $165,000
  - Small fixes (supply lines, fixture replacement) = $120,000
  - No-cost fixes (faucet, valve or stop replacements) = Absorbed by OPS-minor
  - Flushing Pilots – 60% Design expense
    - Onahan = $50,000
    - Orr = $94,000

- Time and learning – a lot in year 1!

“A stitch in time saves nine”
Lessons Learned From Testing

- Inactive Fixtures are at significantly Higher Risk for high Lead levels
- Lead can be Anywhere, but age does matter. In the buildings that tested positive
  - Percentage of buildings Pre-1986 with Above Action Level Fixtures - 86%
  - Percentage of buildings Post-1986 with Above Action Level Fixtures - 14%
  - Two brand new schools tested positive with at least one fixture above AAL
- Preventive Maintenance flushing helped with underutilized schools
- Stagnation is a key contributor to particulate build up in our systems
- Need to turn over building water system
- Plumbing system construction- water main or fixture replacement can impact Water Quality
**Remediation Protocols When Test Shows Lead**

**Protocols** - Developed in collaboration with CDWM,

- **Step 1:**
  - Replace or clean aerators or screens (if applicable) + 7 days of light flushing or running of cold water + 1 day of normal usage + 1 day for re-sampling
  - If re-test shows elevated lead

- **Step 2:** Remediation Steps / Minor Repairs / Major Repairs
  - If Below Actionable (<15 ppb), the fixture is placed back into service.
  - If Above Action Level (>=15 ppb), the Building Engineer is to remove the supply lines, bubbler or faucet head (if present), repeat flushing protocol above, and then,
    - If Below Actionable, the Building Engineer will replace the supply line and either the bubbler or faucet head (Minor Repairs)
    - If Above Actionable, CPS’ mechanical engineer consultant will assess the fixture and develop a remediation procedure to be followed (Minor to Major Repairs)

- **CPS Water Testing Application Notifications Development**
Step 3 Fixture Replacement

- Can be routine maintenance replacement
- Existing Conditions and Unrelated issues up the Ante
- ADA height adjustments require plumbing changes impacting suspect material
  - Environmental Costs and impacts
  - Small projects
- Slow process
Step 4 Major Repair/ System Replacement

- Not an option for CPS
  - Cost prohibitive
  - Disruptive
- Ripple effects
  - ADA
  - Environmental
  - Programmatic impacts
- Limited system replacement – only Potable Water System
Replaced Potable Water System at 1 School
Remediation Protocols Breakdown

Remediation Efforts
By Percentage

<table>
<thead>
<tr>
<th></th>
<th>Recommissioned - Flushing</th>
<th>Recommissioned - Minor Repair Work (1st Re-Test)</th>
<th>Recommissioned - Minor Repair Work (2+ Re-tests)</th>
<th>Recommissioned - Major Repair Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sinks</td>
<td>79%</td>
<td>13%</td>
<td>10%</td>
<td>0%</td>
</tr>
<tr>
<td>Drinking Fountains</td>
<td>75%</td>
<td>15%</td>
<td>7%</td>
<td>2%</td>
</tr>
<tr>
<td>Kitchen Sinks</td>
<td>88%</td>
<td>12%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>78%</td>
<td>14%</td>
<td>7%</td>
<td>1%</td>
</tr>
</tbody>
</table>
Filters

- Discussed early, but significant operational concerns for Chicago Public Schools
  
  - Cost
  
  - Preventive Maintenance - Most don’t have indicators
  
  - Short usable life in high volume areas
    - Replacing every couple of weeks in HS
  
  - Concerns about exposure to high temperatures resulting in breakdown
    - 60% of schools have AC in classrooms only
    - Extreme temperatures in hallways, lunch room, gyms during summer months
  
  - Timely replacement - Easy to slip through the cracks
Our Primary Solution: Flushing

- CPS’s Preferred Method based upon experience and data
- Scalable
- Every school is unique
- Use Manual, Automatic and Combination
- Verification required, QA/QC
- Long Term Goal is to install and monitor automatic flushing systems
  - Auto Flushing allows daily and even hourly flushing
  - Reduced Stagnation
  - Tailored to the school
  - Control for Occupancy
Flushing: the Advantages

- Flushing counteracts the effects of stagnation
  - Starts day with fresh water by turning over building plumbing. Limits stagnation to a brief time before typical occupancy starts, versus 10-18 hours
  - Flushes any settled particulates
  - Ortho-phosphate application with each use
    - Stimulates application and replenishment
  - Flushing Simulates usage, where none would occur normally
- Improve water quality and perception
flushing: the disadvantages

- It only works well when it's done and done consistently
- Can be time and labor intensive
  - We developed a solution: automated flushing

- Water lost down the drain
  - We are working towards a solution
With testing, we very quickly learned that unused fixtures were our biggest risk and flushing can significantly reduce that risk.

But it takes time and staff.

- Time studies & testing for riser flushing ranged from 1 hour (60k sf) to 4.5 hours (750k sf)
- 470 Building engineers, but 527 Campuses
- Other responsibilities - snow removal, boilers, cooling, misc. stuff
- Food Services (NSS) has an ongoing food prep/kitchen flushing protocol
Drinking Fountain Preventive Maintenance Flushing

- PM added to Work Order system after Phase II testing completed, to flush all drinking fountains for 1-2 minutes prior to the start of school after a day off. Completed once a week during summer.

- Concern about Implementation Rate
  - Easy to sign off on WO, but hard to track QA/QC
  - 80% Compliance in early August
  - 100% Prior to Start of school

- Short term solution, but big benefits
- PM was helpful in reducing our exposure to positive tests from orphan fixtures in some of our larger, yet underutilized schools
- Building Risers were turned over prior to the start of school as an additional PM
Our Innovation: Automated Riser Flushing Pilot

- Basic requirements- 1/2, 3/4 or 1” Solenoids, Control Timer, throttle and discharge – Discharge Design flow is 20-25% of potential – Slow and steady
- Good option when access and space allow for install and monitoring
- 5 Versions based upon Building BAS or lack there of
Riser Flushing Pictures
Automatic Flushing Devices – Onahan School

Auto-Flush Prototype at Drinking Fountains with Porcelain Body (Onahan School)

Multi-Circuit Timer

Copper piping with Solenoid Valve controlled by Timer, draining to open hub drain
More Innovation: Automated Drinking Fountain Flushing

- Necessity is the mother of invention. Developed by BE
- Fits in the DF, needs 110 power supply
- Flushes fixture and Riser
- Lower volume for a longer period
- Significantly reduces stagnation time at the fixture
- Using Building Hall lighting as control (occupied mode)
- Two stage Flushing - start of day for 10 mins, then 1 min per hour
- Simple install, I module can do multiple fixtures
- Biggest impact at Top of Riser
Automatic Flushing Devices

Self-Contained Auto-Flush Prototypes at Drinking Fountains with Stainless Steel Housing

Von Steuben High School

42 W Madison
Von Steuben & 42 W School Pilots

- 42 W School - Demonstration & Reliability Pilot
- Von Steuben High School (300K SF)
  - Site of first working prototype
  - Building has 7 Risers. 3 Risers w/ Auto Flushing System, plus Main and Original Prototype location
  - Bottle Fillers installed in Conjunction with Auto Flusher on 3rd Floor stimulates building usage
  - Water is cooler
  - Seeing significant particulate count reductions versus non flushed risers
Another Idea: Constant or “Trickle Flow” Flushing

Developed by CWM

Simple system that constantly flushes system-

Best at TOR or EOB

Downside is vandalism

The Spout and Constant flow = Enticing
Orr High School Pilot Project

- Identified as having Poor Water Quality Prior to Testing
- Building is shared by a High School, a Charter School and YMCA Daycare
- 10/30 Fixtures had at least one sample above AL of 15 ppb, Highest at 530 ppb
- Goal is to comprehensively flush the Potable Water System
- Develop models and templates for application system wide
- Initially, Orr’s SOW focused on Riser Flushing- but Top of Riser was contained in a masonry chase with pipe wrapped in ACM
- Applying Drinking Fountain Auto Flushing to Riser Flushing by increasing duration and locations.
- Use of Auto Flushing Commercial Sink Fixtures in key areas
Orr High School Pilot Project

- 18 Drinking Fountain Systems
- 1 Riser Flushing
- 6 Lavatory (Non Potable) Flushing
- Total Potable Fixture Count 30
- Number of main risers and branches?
- Water service from North in Athletic Annex
- Picture of Orr Site
Orr High School
CPS Water Quality Management Plan and Next Step

- Expand and Refine Prototypes
- Developing Program to apply across the system
- Continue Flushing Protocols and PM’s with shift to Auto Flushing
- Retest all Potable Water Sources on a Four Year Cycle
- Use of Big Data and Spot Revivification
  - Flow Verification & Logging
  - Leverage our Wi-Fi Network for Data collection, System monitoring & Verification
  - Spot Testing with Palintest & ANDalyze
  - Use of Temperature as control
Closing thoughts

- How do we maintain water quality between tests?
- How do we comfortably state the water is safe on a daily basis?
- Testing is just a snapshot in time.
- Potential Solutions Discussed- Water Quality Management Plan
  - System Replacement
  - Fixture Replacement
  - Filters
  - Flushing
CPS Mitigation and Flushing

- Questions
  - rmchristlieb1@cps.edu
  - http://cps.edu/Pages/LeadTesting.aspx
Bottled Water: a Good Solution?
Key Takeaways

- Most tap water is safe
- No region can assume that it has zero risk of lead exposure in school tap water
- Water quality is a shared responsibility - government, water utility and the end-user share responsibility for tap water safety.
  - Schools must assume responsibility for lead testing
- Testing is not too complicated and not very expensive
- But - the many variables in water supply, water systems, and premise characteristics and use patterns mean that there is no one solution
- Take advantage of resources and technical assistance
Questions?

A copy of slides from today’s webinar and a resource packet will be emailed out later today.

A recording of this webinar will be posted at DrinkingWaterAlliance.org/News in the coming days.

For more resources on school drinking water safety, access, and education and promotion, see DrinkingWaterAlliance.org