# Surveillance of Lead and Copper in Public Water Supplies

W. David Brown, RS MPA
Surveillance Coordinator
Children's Environmental Health
DHHS/Division of Public Health
Tel: 919-218-5460
Email: w.david.brown@dhhs.nc.gov

# In this presentation you will learn:

- EPA action levels for lead and copper
- Procedure for exceedances of the lead and copper drinking water standards
- Health effects of lead and copper
- EPA's 3Ts sampling protocol
- .2816 Lead Poisoning Hazards in Child Care Centers

The EPA issued regulations in 1991 to control lead and copper in drinking water known as the Lead and Copper Rule also referred to as the LCR or 1991 Rule. These were not health-based regulations.

**WHY ?** Lead and copper enter drinking water primarily through plumbing materials. Exposure to lead and copper may cause health problems ranging from stomach distress to brain damage.

# Action Levels

The EPA set the action level for lead in water at 15 ppb (0.015 mg/L and at 1.3 ppm (1.3 mg/L) for copper.

The action level for lead is a level at which the EPA is concerned about corrosion and requires water systems to take additional steps to prevent corrosion.

# LCR vs 3Ts

Lead and Copper Rule (LCR)

Required for all community water systems.

System-wide approach

If lead concentrations exceed an action level of 15 ppb in more than 10% of customer taps sampled, the system must undertake a number of additional actions to control corrosion.

3Ts for Reducing Lead in Drinking Water

Voluntary Program to assist schools and child care facilities with training, testing and taking action.

Adopted by reference in rule .2816 Lead Poisoning Hazards in Child Care Centers effective October 1, 2019.

# LCR Requirements for Exceedances

- If 10 percent of the homes that are tested have lead levels greater than the action level (AL) of 15 ppb, the system must:
- Increase monitoring, and
- Undertake additional efforts to control corrosion and inform the public.

# CEHB Procedures

- Surveillance Coordinator receives a copy of the laboratory test results from DEQ (Analytical Chemistry Laboratory (**ACL**) report:

# Example Sampling Report

| | | C/NTNC | | | EPA RULE | ROUTINE | LAB SAMPLE # | LAB # | | COLLECTOR | COL DATE | COL TIME | | RESULT | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lead: | | | | | | | | | | | | | | | |
| NC0149131 | PRESSLEY ACRES | C | IREDELL | D01 | LCR | RT | CC10227-02RE1 | 37724 | ENCO | CHRIS WILSON | 6/14/2019 | 06:45:00 | LEAD | 0.02 | MG/L |
| NC0149155 | WESTOVER S/D | C | IREDELL | D01 | LCR | RT | CC10230-05RE1 | 37724 | ENCO | BRENDA DOBSON | 6/13/2019 | 06:00:00 | LEAD | 0.0264 | MG/L |
| NC6027001 | SOUTHERN OUTER BANKS WTR SYST | C | CURRITUCK | D01 | LCR | RT | 37729_19-24620 | 37729 | ENVIRONMENTAL CHEMISTS, INC. | | 6/12/2019 | 07:00:00 | LEAD | 0.057 | MG/L |
| Copper: | | | | | | | | | | | | | | | |
| none | | | | | | | | | | | | | | | |

20 ppb

26.4 ppb

57 ppb

# Notification

- Environmental Health Supervisor
- State Toxicologist
- CEHB Supervisor
- Regional Environmental Health Specialist

Check your records to see if the water supply in the report serves a facility* that is inspected by your department.

If it is inspected, have an authorized agent collect an inorganic water sample to determine if the facility has an approved water supply.

**School, child care, aftercare, restaurant, summer camp etc.*

N.C. Department of Health and Human Services
State Laboratory of Public Health
4312 District Dr., PO Box 28047, Raleigh, NC 27611
Environmental Sciences, Environmental Inorganic Chemistry Laboratory



# Special Lead Analysis of Drinking Water Request and Chain of Custody Record

**Facility Name:** _____ (if applicable)

**Owner Name:** _____

**Testing Site Address:** _____ (Street)

_____ (City) (State) (Zip Code)

**Owner Address:** _____ (Street)

_____ (City) (State) (Zip Code)

**County:** _____

**Report to:** _____

**EIN #:** _____

**Address:** _____ (Street)

_____ (City) (State) (Zip Code)

**Phone #:** _____

**Health Dept Agency/Org:** _____

**Water Source:** (check one) ☐ Well ☐ Community/Municipal

☐ NCAC 18A .2816 Sample

**Collection Date:** _____

| Laboratory Number | Field Sample # | Sampling Point/Description | Collection Time (24:00 format) | Collected By |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Comments:** _____

_____

**FOR LAB USE ONLY**

**Date and Time of Sample Receipt:** _____

## Chain of Possession:

1. _____ (Signature) _____ (Title) _____ (Inclusive Dates)
2. _____ (Signature) _____ (Title) _____ (Inclusive Dates)
3. _____ (Signature) _____ (Title) _____ (Inclusive Dates)

**Results Reported By:**

_____ (Signature) _____ (Title) _____ (Inclusive Dates)

# EPA's 3Ts Sampling Protocol

**3Ts** – Training, Testing, and Taking Action

https://www.epa.gov/ground-water-and-drinking-water/3ts-reducing-lead-drinking-water-toolkit

Two sample method – using 250-mL bottles

(LCR requires 1 liter bottle)

First draw and 30 second – at the kitchen tap and if available the well head.

**Do not remove the aerator screen.**

# Testing

Test all outlets used for drinking or cooking activities.

- Take a 250-mL first draw sample at all taps used for drinking and cooking.
- All samples should be collected before the facility opens and before the fixtures have been used.
- One 250-mL sample should be taken at each fixture. Note this is a first-draw sample. Therefore, collect the sample immediately after opening the faucet or valve.

# Sampling requirements

8 to 72 hour stagnation period before sampling

If initial sample exceeds action level, follow-up flush testing is required to determine the source of lead, and remediation strategy.

**250 mL samples for 3Ts, vs. 1 L for LCR**


# Follow-up Flushed Sampling

Actions to take if the initial first draw sample meets or exceeds the action level of 15 ppb.

- Restrict access to the problem outlet
- Provide safe alternative water
- Authorized State or County Agent returns to the center to collect a first draw sample and a 30 second flushed sample
- The flushed sample targets interior plumbing.

# Remediation

Appropriate strategy depends on system details and sampling results. Some methods include:

- Flushing (single outlet or whole system)
- Replacing fixtures or components,
- POU filtering
- Reconfigure plumbing to avoid lead sources
- Shut off problem outlets
- Bottled water

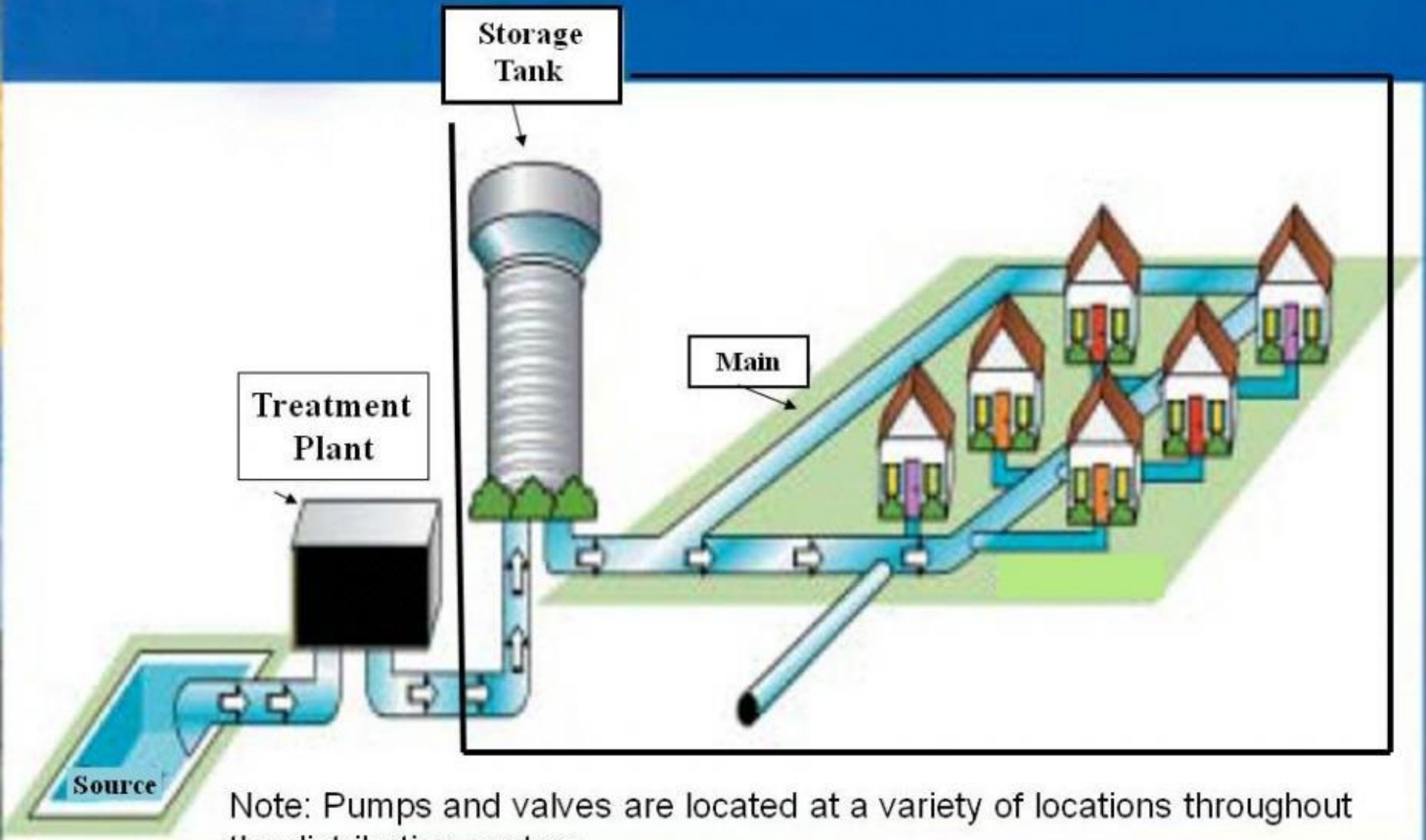
The Surveillance Coordinator also mails an educational packet to the resident or facility that includes:

- Cover letter containing recommendations about steps you can take to reduce the risk of lead or copper exposure from drinking water and contact information
- Laboratory test result

Why does Lead and Copper contamination occur?

How do these metals get introduced into the system?

# Water Supply Distribution System




Note: Pumps and valves are located at a variety of locations throughout the distribution system.

# Water Treatment

Lead contamination in tap water is often triggered by treatment changes that alter the water chemistry, destabilizing lead-bearing mineral scales that coat lead service lines and corroding lead-bearing solder, pipes, faucets, and fixtures.

- Environmental Health Perspectives • volume 117 |
- number 12 | December 2009

- In many cases, lead levels decrease as a building ages because mineral deposits from the water coat the inside walls of pipes, providing a barrier between the lead and the water.
- However, water with low pH (acidic) is too corrosive to deposit this protective coating and in some cases may erode the coating.

# Lead Sources

http://www.motherearthnews.com/uploadedImages/articles/online_articles/2006-12-01/solder.jpg

Lead and lead compounds have been used in a wide variety of plumbing products: pipes, solders, fixtures, service lines.

In general a building can be deemed lead-free if it was built after January 4, 2014.

- Corrosive water (low pH – acid condition) will dissolve metal pipe and fittings, depending on the water's pH, its temperature, and the length of time it is in contact with the lead source.

- Shallow groundwater sources are generally more corrosive than deep wells.

- Soft water enhances dissolving of lead and copper from plumbing because the absence of minerals in soft water tends to make the water more reactive.

# Water Treatment

- Residents of Washington, DC, unknowingly drank water contaminated with lead from 2001 to 2004 when a **switch in water disinfectant from chlorine to chloramine caused the release of lead.** Water company monitoring records cited by the Washington Post in January 31, 2004, showed that more than 4,000 homes tested had tap water lead levels above 15 ppb …hundreds had lead levels above 300 ppb; in a few homes and 1 school, the water from the tap contained more than 5,000 ppb lead.

# Durham and Greenville NC

In 2006, changed the coagulant chemical used to clear the water of its natural turbidity.

The change from alum to ferric chloride altered the chloride:sulfate ratio of the drinking water and also caused corrosion and lead contamination of the water supply.

If grounding wires from the electrical system are attached to your pipes, corrosion may be greater. Check with a licensed electrician or your local electrical code to determine if your wiring can be grounded elsewhere.

# Does lead affect everyone equally?

EPA estimates that 10 to 20 percent of human exposure to lead may come from lead in drinking water. Infants who consume mostly formula prepared with tap water can receive 40 to 60 percent of their exposure to lead from drinking water.

- Young children, infants and fetuses are particularly vulnerable to lead poisoning. A dose of lead that would have little effect on an adult can have major health implications for an infant.

- Children more rapidly adsorb any lead they consume than adults.

"…lower blood lead levels have been associated with measurable changes in children's mental development and behavior. These include hyperactivity; deficits in fine motor function, hand-eye coordination, and reaction time; and lowered performance on intelligence tests."

*http://www.niehs.nih.gov/health/topics/agents/lead/*

- Adults with kidney problems and high blood pressure are more likely to be affected by low levels of lead than the general population. Lead is stored in the bones allowing it to be released even after exposure stops.
- The presence in bone increases the concern for exposure at all points of the life cycle.

# Contamination often occurs in the plumbing system

Corrosion of plumbing is the greatest cause for concern.

http://farm1.static.flickr.com/115/258564499_23b0951602.jpg?v=0

http://www.epa.gov/OGWDW/contaminants/dw_contamfs/copper.html

# What are the health effects of copper?

- Copper is an essential nutrient, required by the body in very small amounts. However, the EPA has found copper to potentially cause adverse health effects when people are exposed to it at levels above the Action Level (1.3 mg/L).
- High levels of exposure can cause gastrointestinal disturbance, including nausea and vomiting. Use of water that exceeds the Action Level over many years could cause liver or kidney damage.

*http://www.epa.gov/OGWDW/contaminants/dw_contamfs/copper.html*

# How can I reduce my exposure?

If your drinking water is contaminated with lead or copper there are several things you can do to minimize your exposure.

Do not drink or cook with water that has been in contact with your home's plumbing for more than six hours, such as overnight or during your work day.

- Before using water for drinking or cooking, "flush" the cold water faucet.
- Do not cook with or consume water from the hot-water tap. Hot water dissolves more lead more quickly than cold water.
- If you need hot water for making baby formula, draw water from the cold tap and heat it.
- Clean aerator screens on a regular basis.

# Treatment Options

- Flushing the water before using for drinking or cooking is a practical option.
- Water run from the tap during flushing can be used for non-consumption purposes such as watering plants, washing dishes or clothing or cleaning.

- If flushing the system does not reduce lead to an acceptable level, consider an alternative such as bottled water or water treatment.

- If the water is corrosive because of low pH (acidic), a neutralizing filter that contains soda or a phosphate feeder or a tank that contains lime can be used to raise the pH of the water. This will reduce corrosion problems.

# Reverse Osmosis

Reverse osmosis and distillation treatment can be used to remove copper and lead from drinking water. Typically, removal by reverse osmosis or distillation is used to treat water at one faucet.

*http://orderwaterfilters.com/P3500ro.jpg*

# Questions?