

# Committee on Water

NARUC  Summer  
Policy Summit



# **Committee on Water**

## **Beyond Lead: Emerging Contaminants and Meeting Customer Expectations**

# Contaminants of Emerging Concern

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Sr. Research Scientist

# Contaminant Types



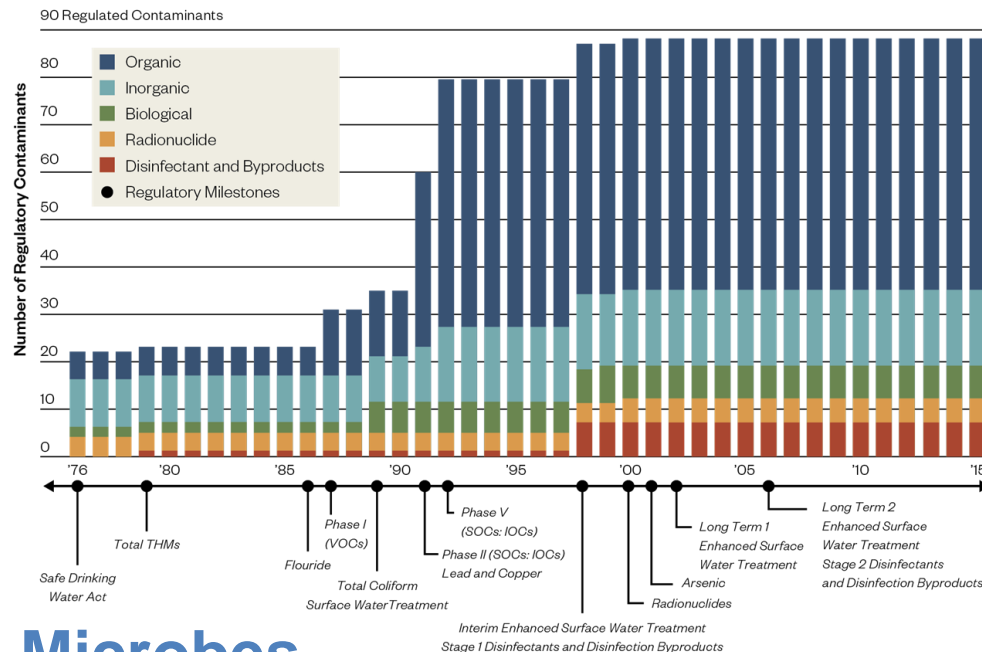
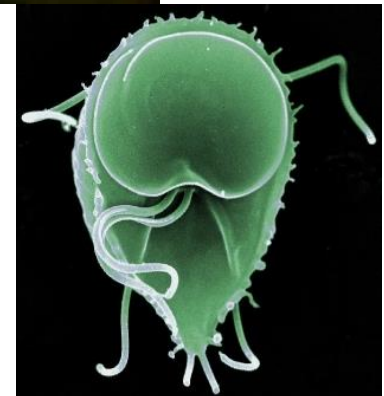
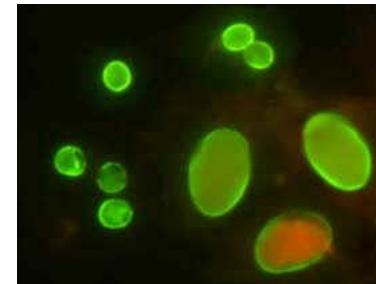
- **Pharmaceuticals and Personal Care Products**
  - **Human and animal drugs:** Antidepressants, cholesterol lowering drugs, antibiotics, ibuprofen, acetaminophen, birth control pills and hormone replacement therapy drugs, enhanced performance and illicit drugs...
  - **Food and lifestyle related products:** Nicotine metabolites, caffeine, artificial sweeteners, triclosan, sunscreens, musks, fragrances, allergens...
- **Industrial Chemicals:** perchlorate, PFCs, detergents, atrazine, pesticides, fungicides, herbicides, PBDEs, phthalates, dioxins, hydroxylated PCBs and PAHs, BPA, benzotriazoles...
- **Natural compounds:** Hormones, cyanotoxins...
- **Disinfection By-products** Nitrosamines, halogenated DBPs (brominated, iodinated)
- **Nanoparticles** TiO<sub>2</sub> and silver...
- **Biological** New materials; organisms (some viruses and bacteria)...



# Current Water Quality Issues

## I. Chemicals- organics and inorganics

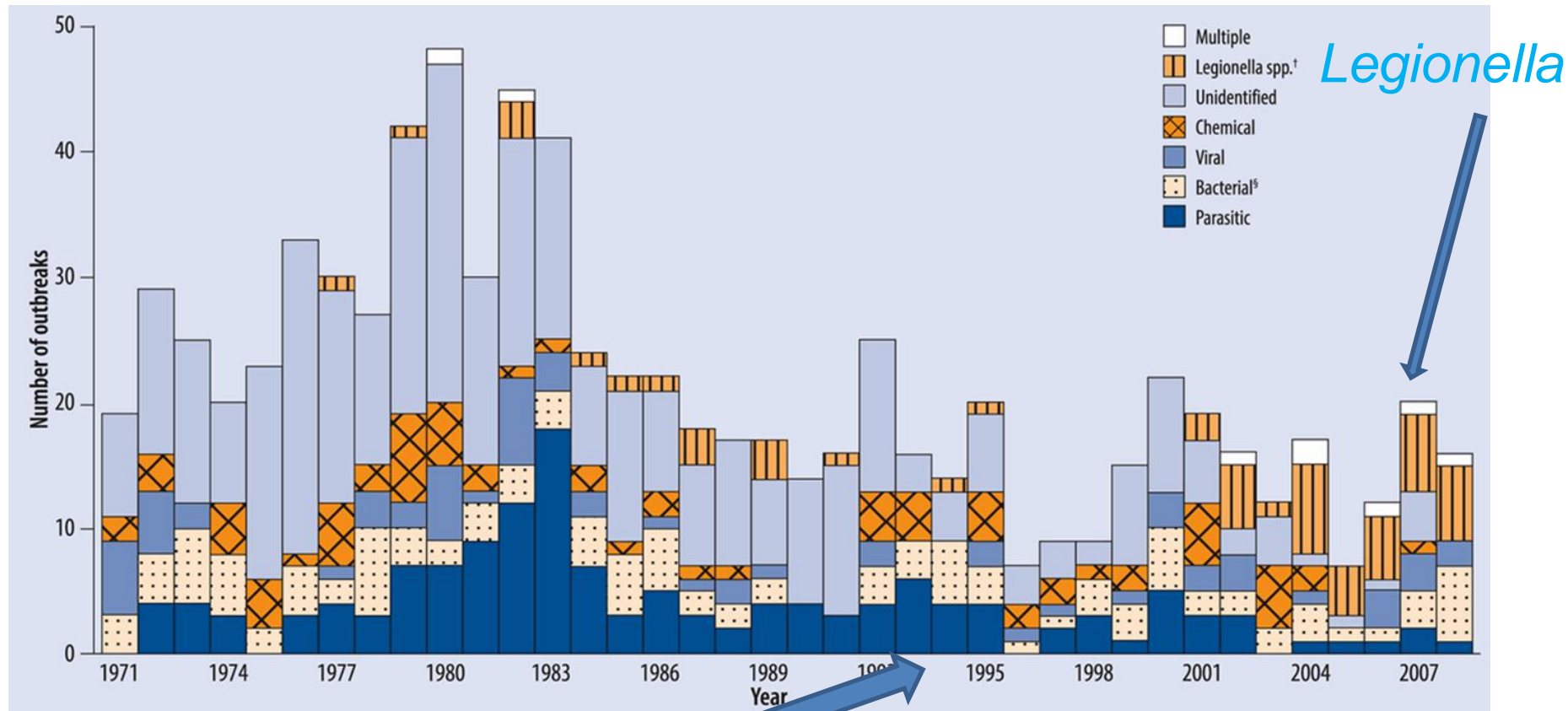
- **130 million chemicals**
  - novel substances synthesized 2.6 sec
  - radiologicals, disinfectants and Disinfectant By Products (DBPs)



## II. Microbes

- >1,400 microbes can potentially impact water

# Water Associated Outbreaks

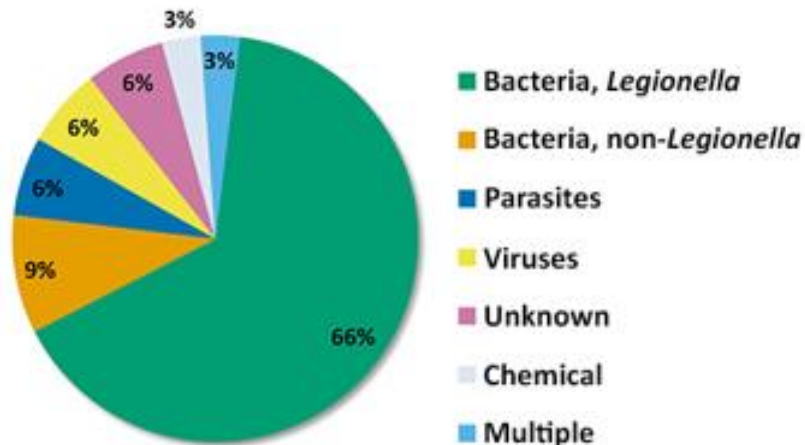


*Cryptosporidium*

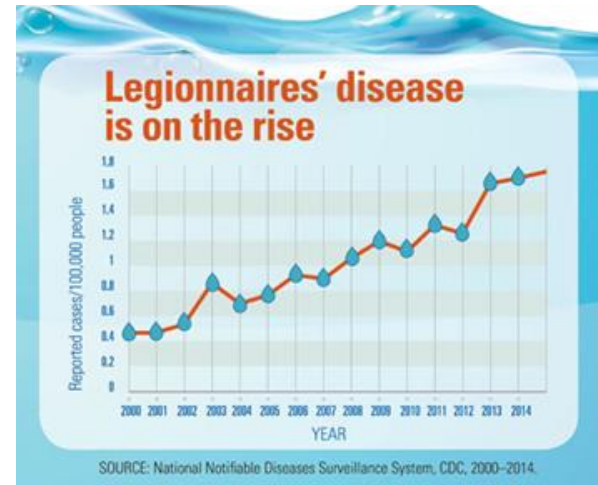
~50% unknown etiology

# Drinking Water Outbreaks- Waterborne Disease and Outbreak Surveillance System, 2011-2012

Outbreaks (N = 32)



\*N=32  
†N=431

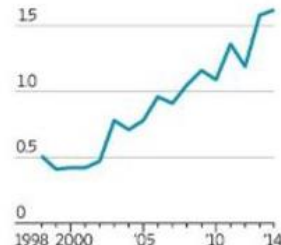


## Disease Profile

In 27 outbreak investigations conducted between 2000 and 2014, the CDC found that potable water was the most frequent source of exposure and resorts and hotels were the most frequent places where outbreaks occurred.

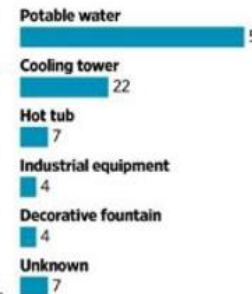
### U.S. reported cases of Legionnaires' disease

2.0 per 100,000 residents

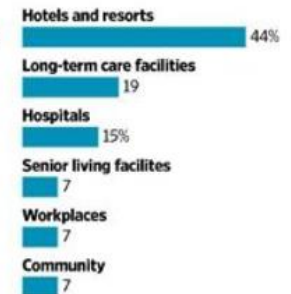


Source: Centers for Disease Control and Prevention

### Source of exposure



### Outbreak settings



THE WALL STREET JOURNAL.

# Emerging Issues

Based on UCMR 3 occurrence:

- ✓ Chlorate- competes with iodine in thyroid gland
- ✓ 1-4,dioxane- not biodegraded and genotoxic (liver, kidneys)
- ✓ Strontium- substitutes calcium in bones of young
- ✓ Vanadium- effect on liver, kidneys, spleen

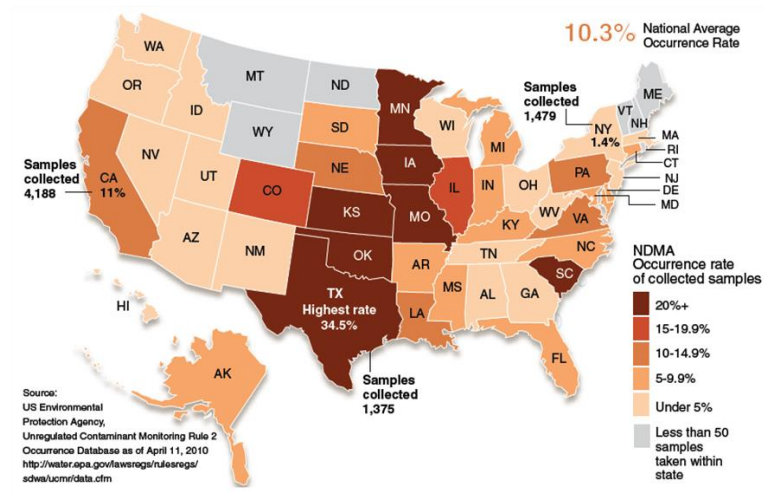
Contaminant	MRL (µg/L)	Ref. Conc. (µg/L)	% results > Ref. Conc.
chlorate	20	210	16%
1,4,dioxane	0.07	0.35	2.9
strontium	0.3	1500	2.8
vanadium	0.2	21	2.7
PFCs	0.01-0.09	0.07	<0.4

- Except specific 'hotspots', lower impact likely from:

- Hormones
- PFOA, PFOS
- Chromium VI

- Others:

- ✓ Nitrosamines
- ✓ Algal toxins
- ✓ LSLs





# UCMR 4 monitoring: 2018-2020

- A total of 30 chemical contaminants:
- **Cyanotoxins (n=10)**
  - total microcystins, microcystin-LA, microcystin-RR, microcystin-LF, microcystin-YR, microcystin-LR, microcystin-LY, nodularin, cylindrospermopsin, anatoxin-a)
- **Metals (n=2)**
  - Germanium, Manganese
- **Pesticides (n=9)**
  - alpha-hexachlorocyclohexane, profenofos, chlorpyrifos, tebuconazole, dimethipin, total permethrin (cis- & trans-) ethoprop , tribufos , oxyfluorfen
- **Brominated HAAs (n=3 groups)**
  - HAA5, HAA6Br, HAA9
- **Alcohols (n=3)**
  - 1-butanol, 2-propen-1-ol, 2-methoxyethanol
- **Semi-volatile organic chemicals [SVOCs]**
  - butylated hydroxyanisole , o-toluidine, quinoline

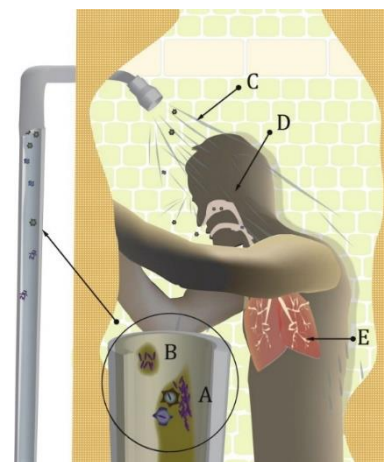
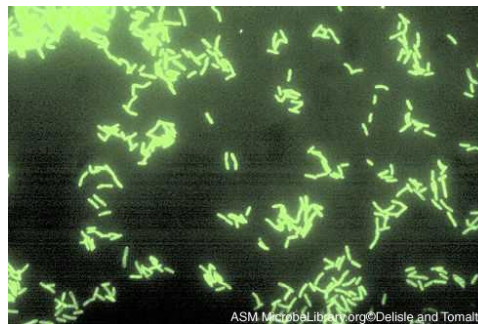
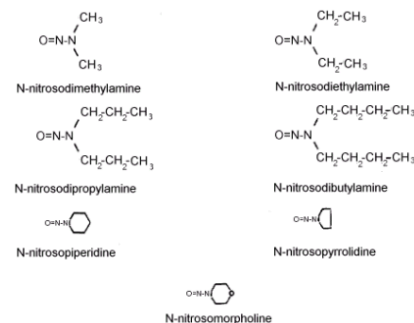


# Emerging Issues

- **Source:** Scarcity issues, emerging chemicals/accidental spills/ weather impacts, waterborne outbreaks, PFC's, Algal toxins in source water and after treatment
- **Treatment/DS:** Nitrosamines, DBPs, various metals, corrosion control
- Microbial regrowth in DS
  - Free living amoebae
    - *Acanthamoeba* spp.,
    - *Naegleria fowleri*
  - *Pseudomonas*
  - *Aeromonas*
- Virulence and antimicrobial genes

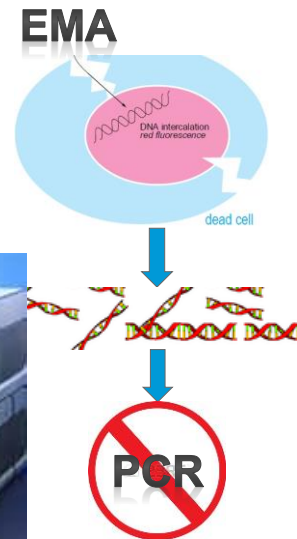
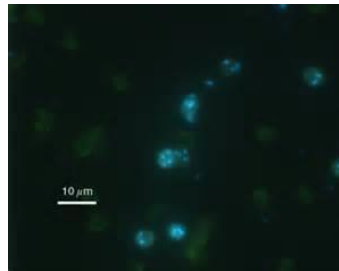
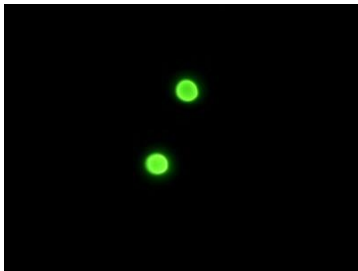
## Premise plumbing: Lead/Copper

- Opportunistic pathogens
  - *Mycobacterium avium*
  - *Legionella pneumophila*



# Health Risks

- Pathogens present acute health risk
  - *Cryptosporidium*- still no effective treatment in sensitive populations
    - ◆ current LT2 data show high occurrence



- *Legionella*- high mortality rate
  - ◆ Major concern in large buildings
  - ◆ risk levels in DW unquantified



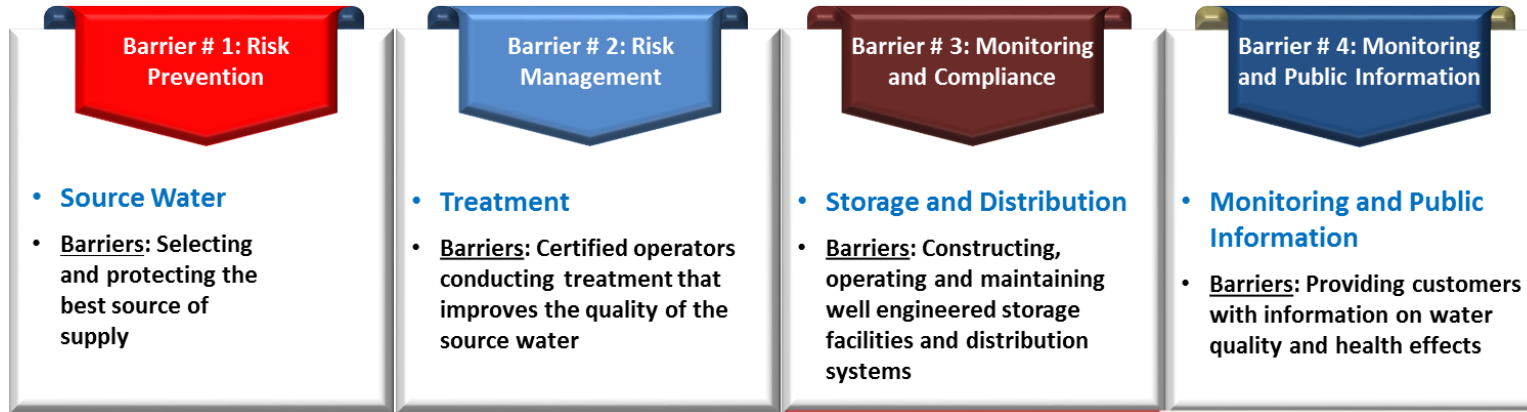
# Deadly Legionnaire's disease found in showers at barracks of Queen's Buckingham Palace guards where hundreds of soldiers live

The legionella bug - which thrives in water droplets - was discovered at Victoria Barracks in Windsor where there are 60 showers used by 300 soldiers



# Water Safety is Key

## Multi-Barrier Treatment for Protecting Public Health



Technology needs to adapt to meet ever increasing challenges



# American Water – Environmental Stewardship

- **What is American Water doing to address contaminants?**
  - **Monitoring Program**
    - ◆ Participation in the Unregulated Contaminant Monitoring Rule-4, where we will collect and share data for an additional 30 contaminants with government regulators
  - **Research**
    - ◆ Team of scientists focused on identifying emerging issues, with an emphasis on contaminants that have a public health impact
  - **Education**
    - ◆ Use of data collected during treatment process to advance knowledge for the water industry in general, for our water quality professionals as well as our customers using a variety of communication tools (e.g. public outreach, education, various forms of media etc)
- **Industry recognition**
  - **150+ water quality awards**
    - ◆ from state and federal regulators, industry organizations for compliance with drinking water quality standards
  - **68 EPA Partnership for Safe Water awards**
    - ◆ for voluntarily surpassing water standards



AMERICAN WATER

NYSE: AWK

# Thank You

## Contact Information:

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# Beyond Lead: Emerging Contaminants and Meeting Customer Expectations

NARUC Summer Policy Summit 2017

# Presentation Overview

**About the  
Foundation**

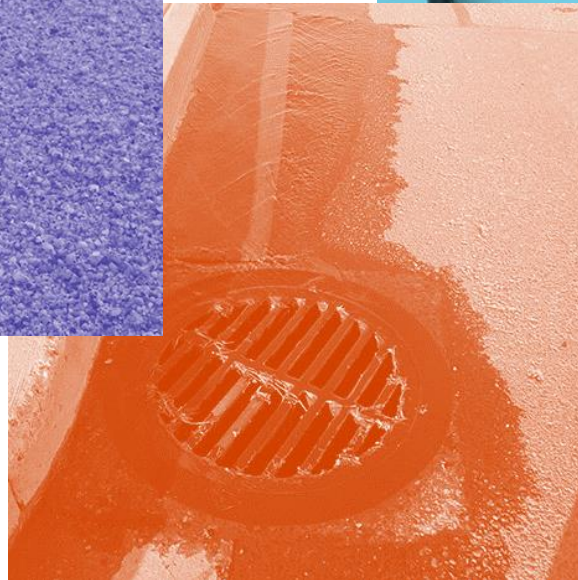
**Emerging  
Contaminants  
& Treatment**

**Customer  
Expectations**

**Summary**

# Water Research Foundation

Advancing the science of water to improve  
the quality of life





# Emerging Contaminants & Treatment

# Mortality Rates: New York City

## 1870 Typhoid

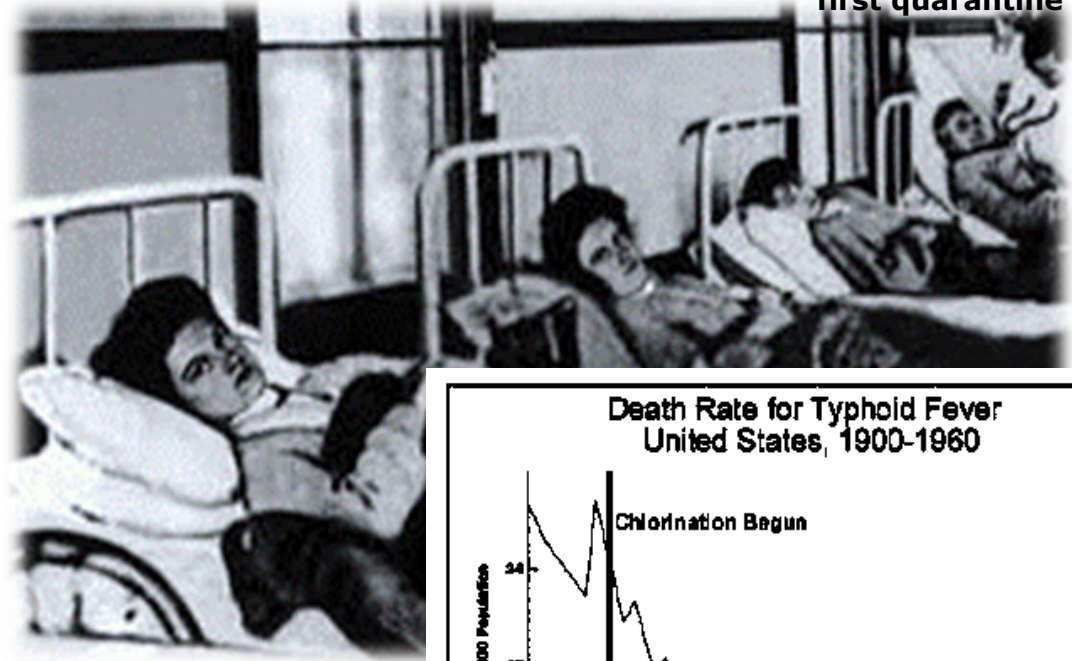
39.3/100,000

**1910**  
**Chlorination**  
**begins in NYC**

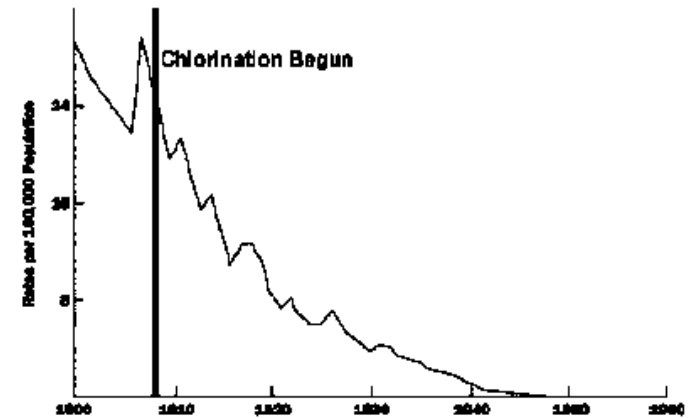
## 1930 Typhoid

1/100,000

"Typhoid Mary" (foreground) in a hospital bed during her first quarantine



Death Rate for Typhoid Fever  
United States, 1900-1960



Source: U.S. Centers for Disease Control and Prevention, Summary of Notable Diseases, 1957.

Source: Changing Patterns of Epidemic Disease in New York City,  
Gretchen A. Condran  
Photo Source: Wikimedia Commons, "Mary Mallon"

# Water Treatment

- Essential to public health
- Conventional Treatment
- Advanced Treatment
  - Required for emerging contaminants



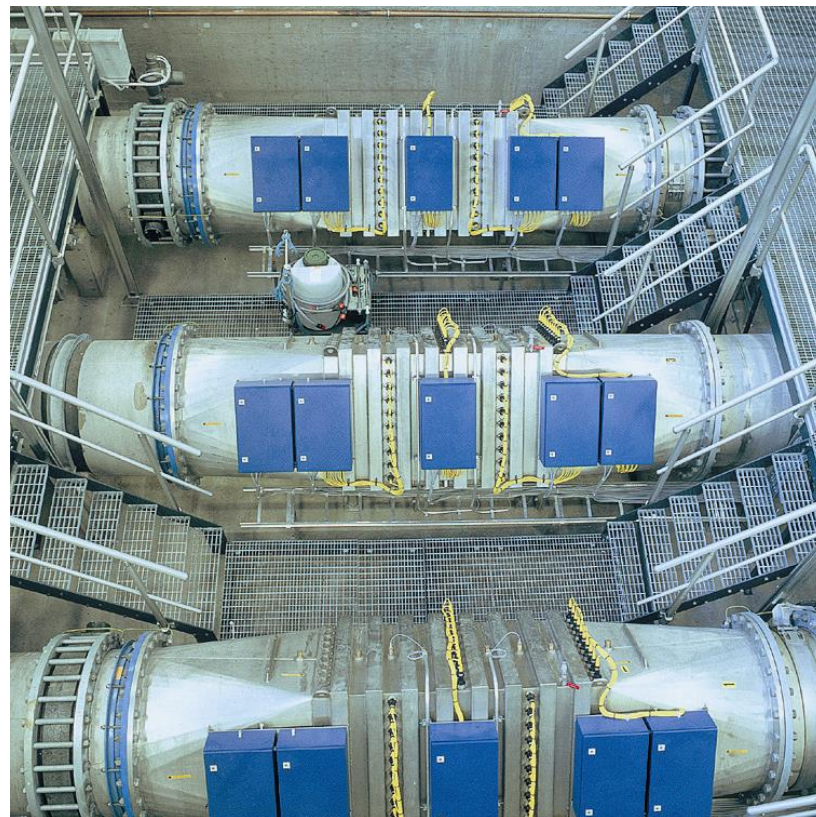
# Emerging Contaminants

- Cyanotoxins
  - DBPs
  - Pharmaceuticals
  - Legionella
  - Perchlorate
  - PFOA/PFAS
- Bromide



# Advanced Treatment

- Oxidation
  - Ozone
  - UV
- Adsorption
  - Carbon
  - Ion exchange
- Filtration
  - Membranes
- Biological Filtration





# Advanced Treatment Costs

- Up to 9 times more energy than conventional
- Higher capital and operating costs
- Skilled operations staffs



# Infrastructure Funding Gap (IFG)

**EPA estimate: \$384 billion over 20 years**

**AWWA's *Buried No Longer* estimate: >\$1 trillion over next 25 years**

**2014 SOTWI Report: \$846 billion over next 25 years**

# Customer Expectations

- Public confidence in drinking water has decreased
  - What is “safe”?
- There is no “zero”
- Quality, quantity at low cost



# Communication is Essential



- Value of water
- Quality of water
- Customer service



# Summary

- Water is public health
- Cost of water is increasing
- Commissioners are critical





# Thank you!!

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**ONE** WATER



# Beyond Lead: Emerging Contaminants and Meeting Customer Expectations

**Michael Montgomery**

U.S. Environmental Protection Agency  
Pacific Southwest Region 9



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Pacific Southwest Region 9





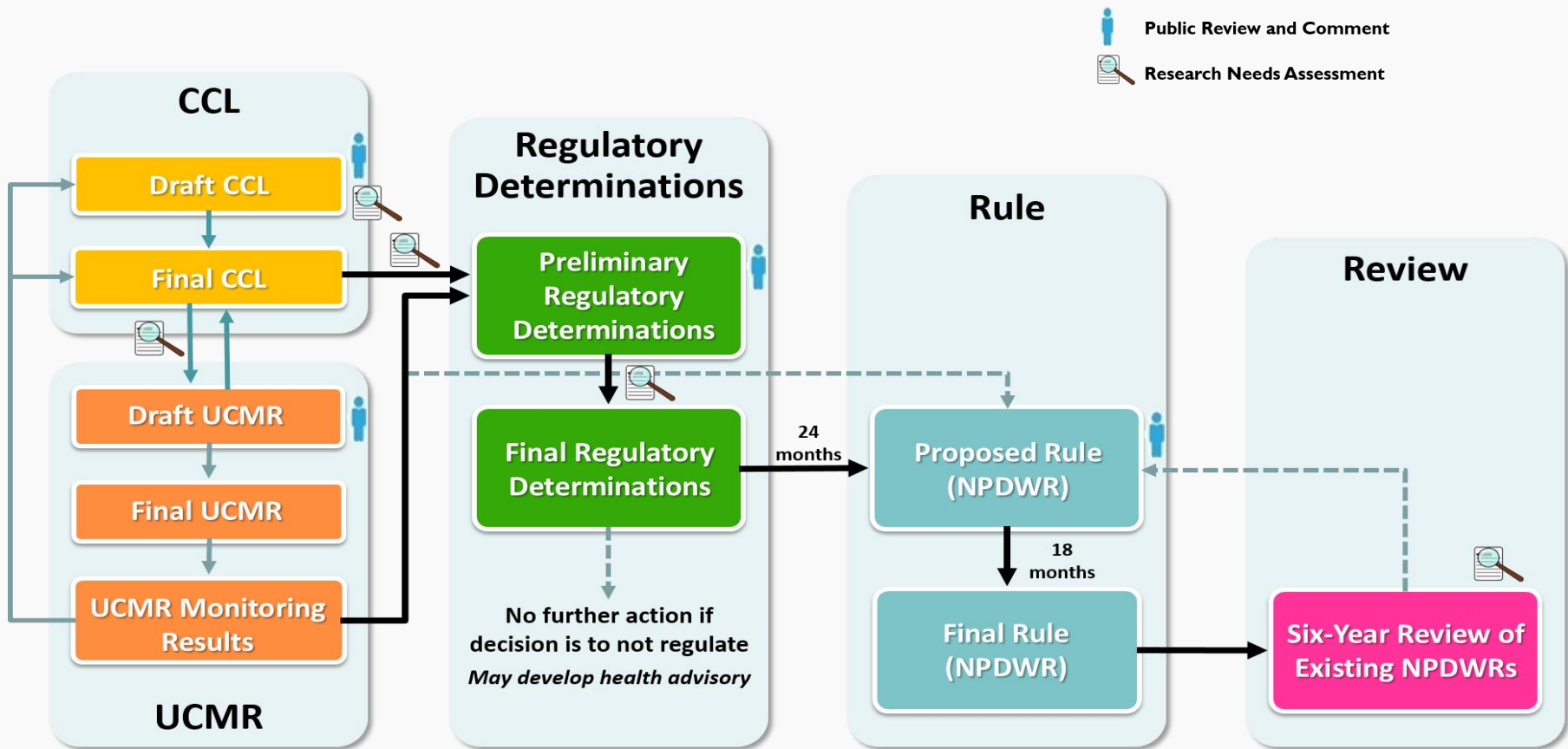


## Balancing Risk Tradeoffs to Provide Safe Drinking Water

- Safe Drinking Water = Source Water Quality Management + Effective Treatment + Consistent Distribution Water Quality
- Distribution systems do not like change.
- Water systems are expected to :
  - identify/mitigate potential simultaneous compliance issues that may arise when source or treatment changes are anticipated.
  - have a plan to detect changes in distribution system water quality
  - correct unintended consequences of water quality changes immediately.
- EPA voluntary programs focused on water system optimization: Partnership for Safe Water and Areawide Optimization



# General Flow of SDWA Regulatory Processes



Increased specificity and confidence in the type of supporting data used (e.g., health, occurrence, treatment) is needed at each stage.



# Emerging Contaminants Management

- Health Advisories - concentrations at or below which adverse health effects are not anticipated to occur over specific exposure durations
  - 2015 Health Advisories for Cyanotoxins (microcystin and cylindrospermopsin)
  - 2016 Health Advisories for Perfluorinated Compounds (PFOA/PFOS)
- Informal non-regulatory technical guidance tools





## Perfluoroalkyl Substances (PFASs) Management

- UCMR Cycle 3 monitoring: Jan 2013 - Dec 2015 included 6 PFASs
- PFOA and PFOS most extensively produced and studied
- 2009 provisional health advisories: PFOA (400 ppt), PFOS (200 ppt)
- May 2016 revised lifetime health advisory: 70 ppt (single/additive)
- Acute short-term advisory for sensitive subpopulation
- 15 of 57 water systems impacted nationwide in Region 9
- State/water system collaboration to mitigate exposure
  - Conduct followup monitoring
  - Provide consumer notification
  - Reduce concentration in delivered water (source removal, blending, treatment)



# EPA Region 9 Priority: Small Public Water Systems

## Reduce risks to public health

- ✓ Small communities
- ✓ Schools
- ✓ Tribes

## Priority health focus

- ✓ Arsenic
- ✓ Lead

## Strategies

- ✓ Enhanced state & stakeholder engagement
- ✓ Financial incentives & technical assistance
- ✓ Measures for alternative water
- ✓ In-depth compliance reviews of systems with a history of non-compliance
- ✓ Comprehensive compliance tracking and strategic enforcement







# QUESTIONS?

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