



# 23<sup>rd</sup> Annual Chicago Infection Control Conference

September 14, 2018

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Ms. Dunlap has disclosed that there is no actual or potential conflict of interest in regards to this presentation

The planners, editors, faculty and reviewers of this activity have no relevant financial relationships to disclose. This presentation was created without any commercial support.

# Learning Objectives

At the conclusion of this course participants will be able to

- **Understand how *Legionella* spreads and grows in manmade water systems**
- **Identify the essential components of a water management plan as outlined by CDC guidance**
- **Recognize industry standards and best practices related to water management planning and environmental sampling**

# To obtain credit you must:

- **Be present for the entire session**
- **Complete an evaluation form**
- **Return the evaluation form to staff**

Certificate will be sent to you by e-mail upon request.

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# Avoiding Amplification and Aerosolization: Controlling *Legionella* in Water Systems

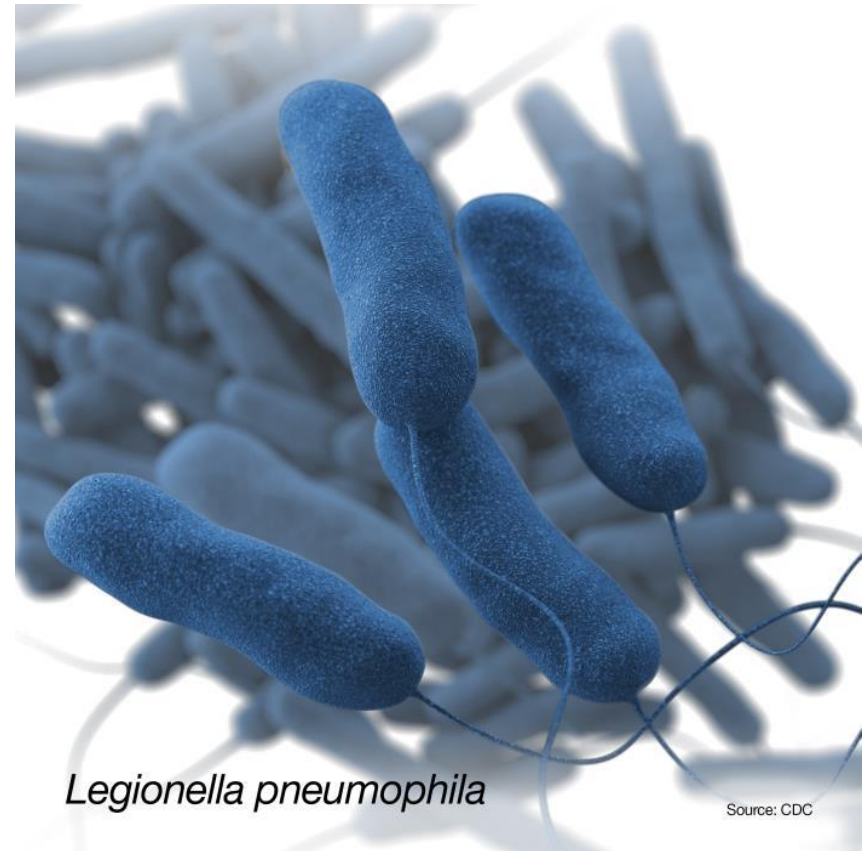
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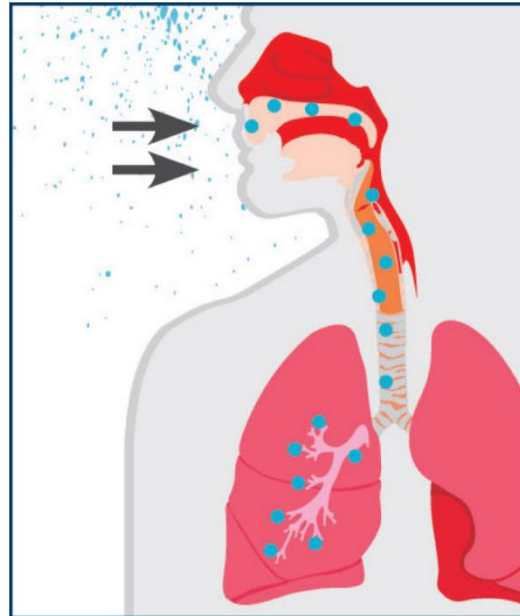
# Legionella

- Gram-negative bacillus
- Intracellular parasite of free-living protozoa primarily found in freshwater
- Can live and grow in biofilms
- More than 60 species
- *L. pneumophila*: ~90% of reported U.S. cases

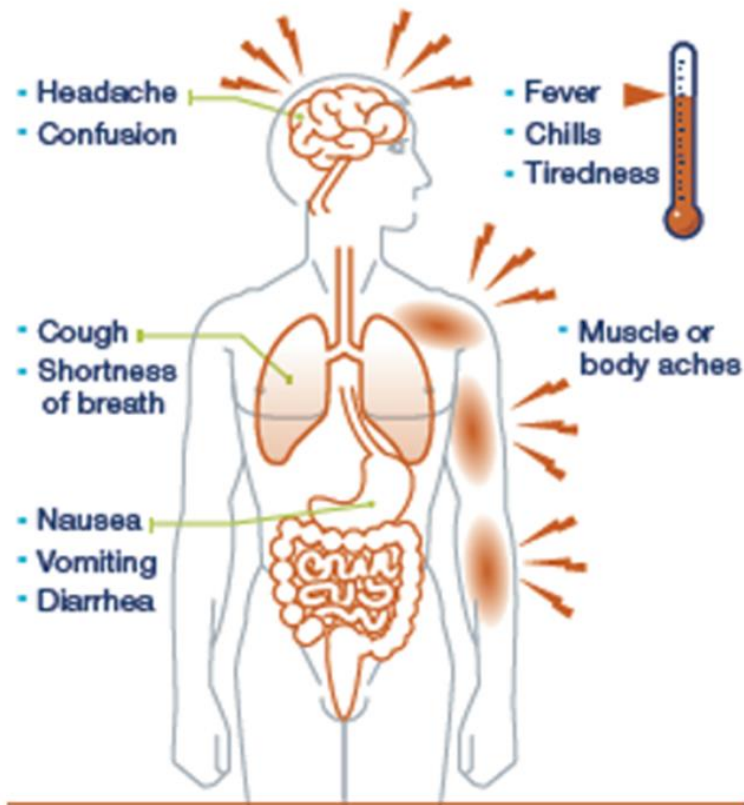


# Transmission

- To susceptible host via aerosolized water droplets



# Two manifestations of illness



- Pontiac fever
  - Flu-like (fever, chills, fatigue)
  - No pneumonia (lung infection)
  - Does not typically result in hospitalization or antibiotics
  - Typically self-resolving
- Legionnaires' disease
  - Severe pneumonia
  - Fever, myalgia (muscle pain), cough, shortness of breath
  - Treated with antibiotics
  - Hospitalization is common

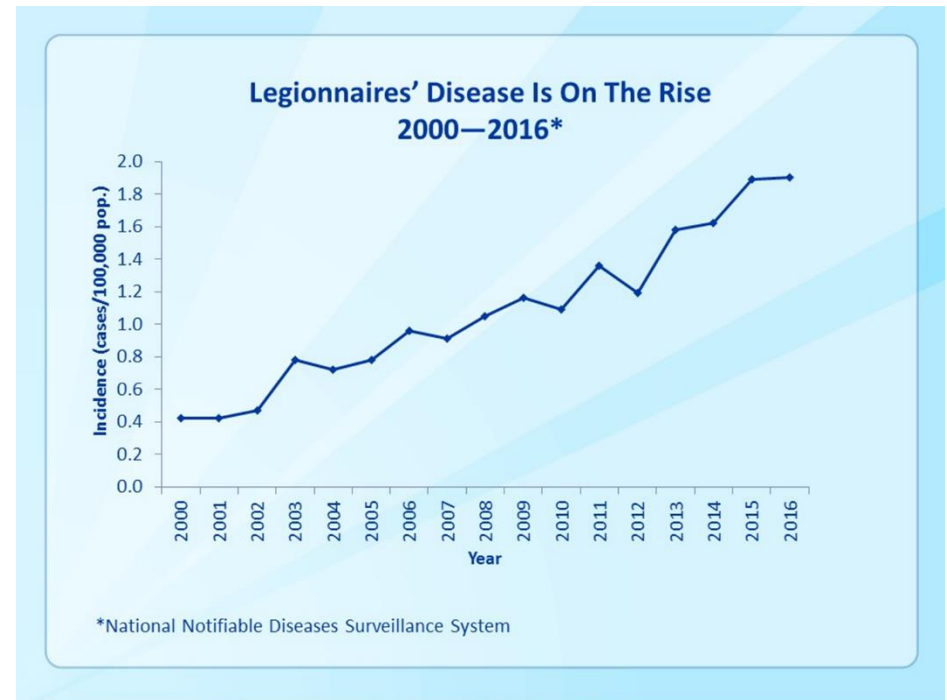
# Risk factors for Legionnaires' disease

- Age  $\geq 50$  years
- Smoking (current or historical)
- Chronic lung disease such as emphysema or COPD
- Immune system disorders due to disease or medication
- Underlying illness such as diabetes, renal failure, or hepatic failure



# Legionnaires' Disease

- About 6,100 cases of LD were reported in the US in 2016 (CDC)
- Cases reported to the CDC has increased fourfold since 2000
- Illness traditionally associated with summer and early fall, but can happen any time of the year
- About 1 in 10 people who gets LD will die due to complications (CDC)
- For those who get LD during a stay in a healthcare facility, about **1 out of every 4** will die (CDC)



# From *legionella* in fresh water to clinical disease: a multi-step cascade

*Legionella*  
lives in fresh  
water



- Natural reservoir for legionella
- Insufficient quantities to cause disease

Certain conditions in  
large, complex water  
systems can lead to  
legionella amplification



- Temperature (77-108°F)
- Stagnation
- Scale and sediment
- Biofilm
- Protozoa
- Absence of disinfectant

Certain devices  
can aerosolize  
water containing  
*legionella*



- Showerheads and sink faucets
- Cooling towers
- Hot tubs
- Decorative fountains

*Legionella* can be  
transmitted to  
susceptible hosts  
and cause  
disease



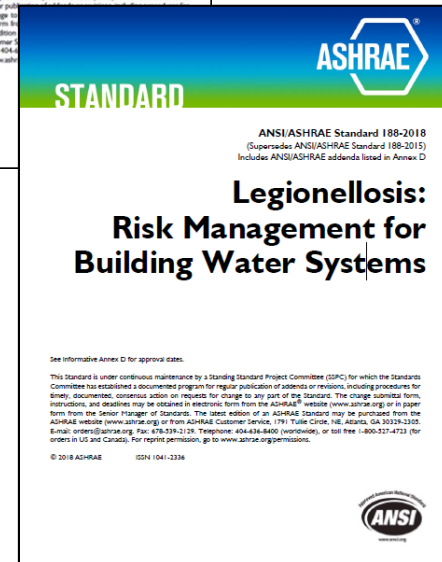
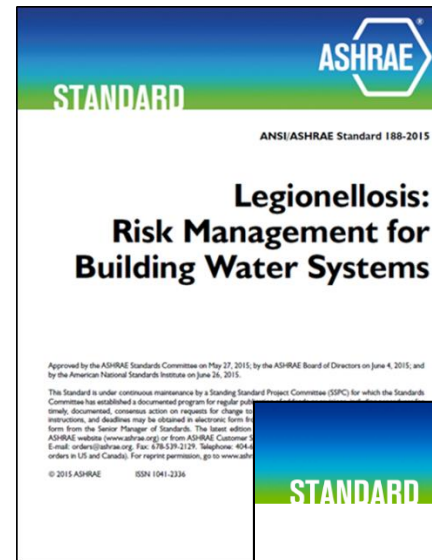
- Age > 50 years
- Smoking
- Weakened immune system
- Chronic disease

# Water Quality Management Planning

- Development of a water quality management plan helps facilities identify areas or devices in water systems where Legionella might grow (amplify) or spread (aerosolize) to people so facilities can reduce risk
- **WQMPs are unique to each facility and their water systems**
- CDC released a toolkit as a practical guide for implementing the ASHRAE 188-2015 standard
- Think **HACCP**
  - Hazard Analysis Critical Control Point
  - Systematic, preventative approach common to food safety programs
- CDC outlines 7 steps in developing a comprehensive WQMP

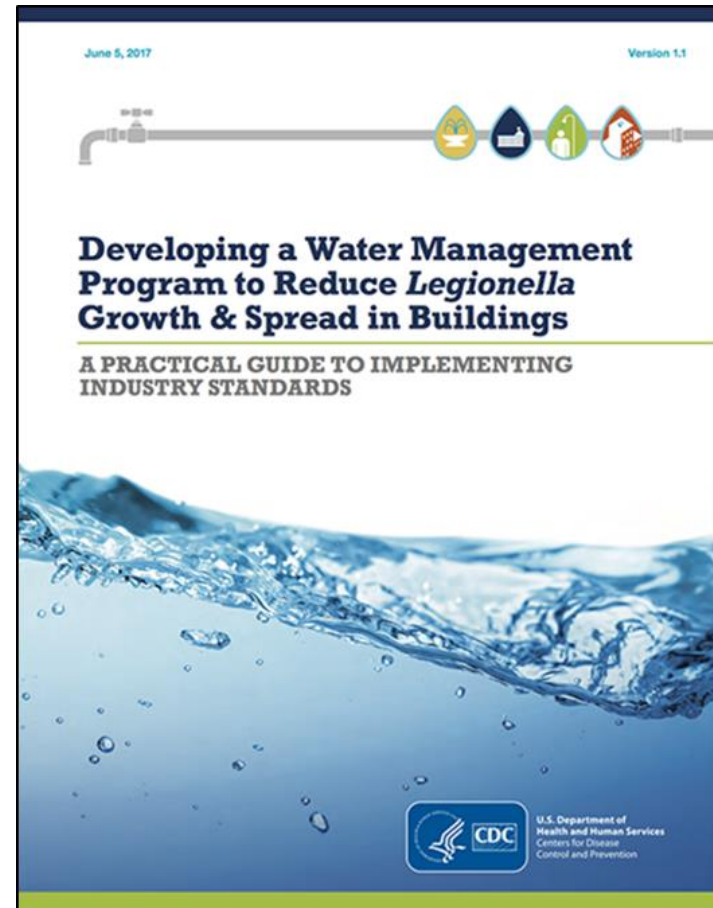
# ANSI/ASHRAE Standard 188-2015

- Framework for proactively managing building water systems and reducing the potential for Legionella growth and amplification in these systems
- Defines:
  - Types of building and devices that need water management programs
  - Minimum components of a water management program
  - Devices that need to be controlled to prevent growth and spread of Legionella
  - When and how often the WQMP should be reassessed and updated
- August 2018
  - ASHRAE released ASHRAE 188-2018



# CDC Toolkit


- “Developing a Water Management Program to Reduce Legionella Growth and Spread in Buildings”
- ASHRAE 188-2015
- Yes/No Worksheet to identify areas of potential growth or amplification in building water systems
- Walkthrough of the elements of a WQMP
- Special sections and considerations for healthcare facilities



# Centers for Medicare and Medicaid Services Requirements

- June 2, 2017 – CMS issued a memorandum requiring Medicare certified healthcare facilities to have water management policies and procedures to reduce the risk of growth and spread of *Legionella* and other opportunistic pathogens
- Water management policies should consider physical controls, temperature management, disinfectant level control, visual inspections, and environmental testing

DEPARTMENT OF HEALTH & HUMAN SERVICES  
Centers for Medicare & Medicaid Services  
7500 Security Boulevard, Mail Stop C2-21-04  
Baltimore, Maryland 21244-1050



Center for Clinical Standards and Quality/Survey & Certification Group

Ref: SAC 17-30-Hospitals/CAHs/NHs  
REVISED 06.09.2017

DATE: June 02, 2017

TO: State Survey Agency Directors

FROM: Director  
Survey and Certification Group

SUBJECT: Requirement to Reduce *Legionella* Risk in Healthcare Facility Water Systems to Prevent Cases and Outbreaks of Legionnaires' Disease (LD)  
\*\*\*Revised to Clarify Provider Types Affected\*\*\*

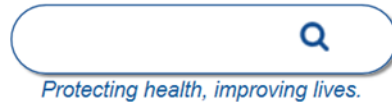
**Memorandum Summary**

- **Legionella Infections:** The bacterium *Legionella* can cause a serious type of pneumonia called LD in persons at risk. Those at risk include persons who are at least 50 years old, smokers, or those with underlying medical conditions such as chronic lung disease or immunosuppression. Outbreaks have been linked to poorly maintained water systems in buildings with large or complex water systems including hospitals and long-term care facilities. Transmission can occur via aerosols from devices such as showerheads, cooling towers, hot tubs, and decorative fountains.
- **Facility Requirements to Prevent Legionella Infections:** Facilities must develop and adhere to policies and procedures that inhibit microbial growth in building water systems that reduce the risk of growth and spread of *Legionella* and other opportunistic pathogens in water.
- **This policy memorandum applies to Hospitals, Critical Access Hospitals (CAHs) and Long-Term Care (LTC). However, this policy memorandum is also intended to provide general awareness for all healthcare organizations.**

**Background**

LD, a severe sometimes fatal pneumonia, can occur in persons who inhale aerosolized droplets of water contaminated with the bacterium *Legionella*. In a recent review of LD outbreaks in the United States occurring in 2000-2014, 19% of outbreaks were associated with long-term care facilities and 15% with hospitals. The rate of reported cases of legionellosis, which comprises both LD and Pontiac fever (a milder, self-limited, influenza-like illness) has increased 266% in the US during 2000-2014, with approximately 5,000 cases reported to the Centers for Disease Control and Prevention (CDC) in 2014. Approximately 9% of reported legionellosis cases are fatal.

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## Legionnaires' Disease

### [New - Legionella Management for Healthcare](#)

\*\*\*IDPH and Illinois Department of Veterans' Affairs continue to collaborate with the Centers for Disease Control and Prevention (CDC) to help ensure the safety and well-being of residents and staff at the Illinois Veterans' Home in Quincy after outbreaks of Legionnaires' disease since 2015. IDPH requested epidemiological assistance from the CDC, who sent a team of environmental and infectious disease specialists to Quincy. The CDC released three reports on the outbreaks (see on the right menu under Publications).

\*\*\*In the 2017 report, sections have been redacted to protect patient confidentiality.\*\*\*

### What is legionellosis?

Legionellosis is a bacterial disease of the lungs caused by *Legionella pneumophila*. The

## RESOURCES

[Legionella](#)

[IDPH Legionella Media Call 1.5.2018](#)

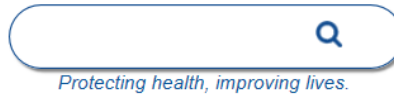
[CDC Legionnaires' Disease Fact Sheet](#)

[CDC - What Clinicians Need to Know about Legionnaires' Disease](#)

## PUBLICATIONS

[Legionnaires' Disease Response and Remediation at IVHQ \(Report to General Assembly, April 2018\)](#)

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## Legionella

*Legionella*, the bacterium that causes a type of serious lung infection known as Legionnaires' disease grows or amplifies in building water systems. Some building water systems have a higher risk for *Legionella* growth and spread than others. Since 2000, there has been over a fourfold increase in *Legionella* infections reported to the Centers for Disease Control and Prevention (CDC) nationwide.

Proactive water management is key to ensuring that building water systems are maintained to reduce the risk of growth and amplification of *Legionella*. The development of a water management plan or program (WMP) helps facilities identify *pathogen* concerns for water systems or devices. WMPs are essential to helping reduce the risk of legionellosis and other diseases among vulnerable patient populations, staff and visitors.

Both the Centers for Medicare and Medicaid Services (CMS) and CDC have issued guidance regarding WMPs. In June 2017, CMS released Survey and Certification Letter 17-30, *Requirement to Reduce Legionella Risk in Healthcare Facility Water Systems to Prevent Cases and Outbreaks of Legionnaires' Disease*. This Letter requires Medicare certified health care facilities to develop, implement, and adhere to a WMP. Also in June 2017, CDC released *Developing a Water Management Program to Reduce Legionella Growth & Spread in Buildings: A Practical Guide to*

### RESOURCES

[CDC Legionella Home Page](#)

[CDC Legionella Toolkit](#)

[CMS Survey and Certification  
Letter 17-30](#)

[VHA Directive 1061](#)

### PUBLICATIONS

 [IDPH Letter to Health Care  
Facilities Regarding Water  
Management Plans](#)

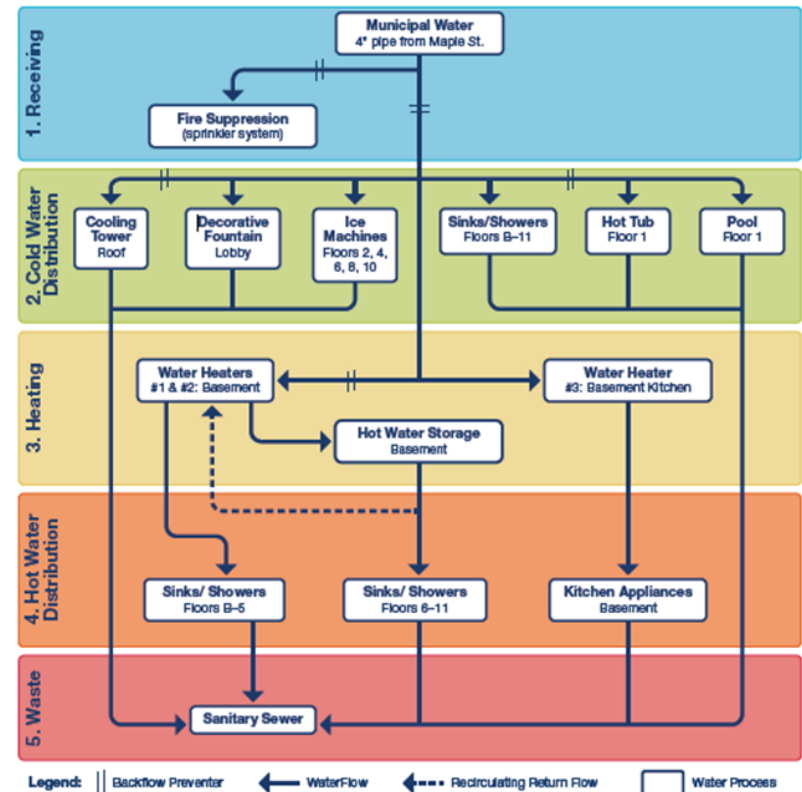


# Step 1. Establish a Water Management Team

- Multidisciplinary
- Water management team can include:
  - Building owners
  - Building administrators
  - Maintenance/facilities/engineering staff
  - Contractors/consultants
  - Public health officials
  - Water suppliers
- Healthcare facilities should also include:
  - Someone who understands accreditation and licensing requirements
  - Someone with expertise in infection prevention
  - A clinician with expertise in infectious diseases
  - Risk and quality management staff

# Step 2. Characterize the Facility Water Systems and Water Quality

- Understand where water enters (and its quality) and how it is distributed through the facility or campus including how cold water is heated and how hot water is stored or distributed
- Flow diagram and written narrative
- Identify potable and non-potable systems
  - Potable: plumbing system
  - Non-potable: HVAC systems, decorative fountains, fire-sprinklers, systems, humidifiers, and irrigation systems
- Healthcare facilities should include descriptions for:
  - Patient care areas
  - Clinical support areas
  - Components and devices utilize water



# Step 3. Identify Areas of Amplification and Potential Exposure

## Amplification

- Where *Legionella* can proliferate
  - Water temperatures between 80-120°F
  - Water recirculated or stagnant
    - “dead ends” and “dead legs”
    - Occupancy
    - Low flow fixtures
  - Nutrient sources
    - Iron (Fe)
  - Events that may disrupt water systems



# Step 3. Identify Areas of Amplification and Potential Exposure

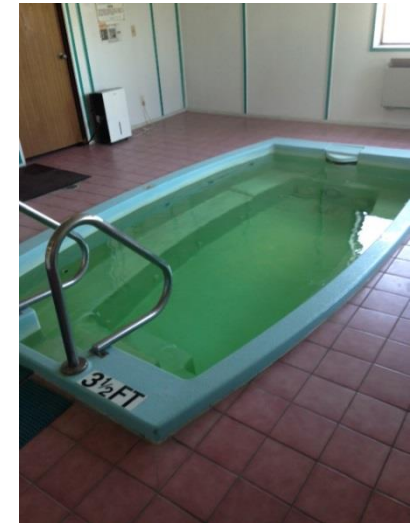
## Potential Exposure

- Where patients, staff, or visitors may be exposed to water droplets
- Healthcare facilities should consider how water is used at point of care and assess risks
- *Aerosolization*
  - Showers
  - Hydrotherapy
  - Decorative fountains
  - Spas/hot tubs
  - Spray irrigation
  - Respiratory equipment
- *Aspiration (less common)*
  - Ice machines
  - Drinking water



# What do we know about source attribution?

- 2016: CDC analyzed data from 27 building-associated outbreaks (2000-2014)
- Common Settings
  - Hotels (44%)
  - Long-term care facilities (19%)
  - Hospitals (15%)
- Common Sources
  - Potable water was the most frequent source of exposure (56%)
  - Cooling towers (22%)
  - Hot tubs (7%)
  - Industrial equipment (4%)
  - Decorative fountains (4%)



Source: Garrison LE et al. *MMWR*.2016; 65 (22):557-61 *CSTE All-State Epi Call*; *CDC*; February 26, 2018

# Step 3. Identify Areas of Amplification and Potential Exposure

For healthcare facilities:

## **High Risk Populations**

- Severely immunocompromised patients
  - Solid organ transplant
  - Bone marrow transplant
  - Oncology
- Risk is not limited by area, but also population
- Should consider all areas where severely immunocompromised may be potentially exposed

## Step 4. Determine Control Measures, Set Limits, and Establish Monitoring Procedures

- Control measures are implemented to reduce risk of growth and spread
- Areas of amplification and potential exposure are critical control points
- Control measures can be physical or chemical
- Set limits that demonstrate control

# Step 4. Determine Control Measures, Set Limits, and Establish Monitoring Procedures

## Physical

- Water age/disinfectant
  - Dead end elimination
  - Flushing programs
- Temperature
  - Storing and circulating water above the favorable growth range
  - Temperature controls should be implemented with anti-scald precautions (e.g. point of use mixing valves)
  - In Illinois, hot water at shower, bathing, and hand washing facilities shall not exceed **110°F**

## Chemical

- Supplemental disinfection
  - Common to non-potable water systems such as swimming facilities, decorative fountains, or cooling towers
  - Significant considerations for supplemental treatment of potable water systems
  - Chemical control should not be applied to potable water systems without observed, documented deficiencies



## Step 4. Determine Control Measures, Set Limits, and Establish Monitoring Procedures

- Anticipate additional hazardous conditions that could be associated with scheduled or unanticipated changes in water quality, including:
  - System start up/shutdown
  - Scheduled maintenance
  - Renovations, construction or installation of new equipment
  - Water main break/water outage

## Step 4. Determine Control Measures, Set Limits, and Establish Monitoring Procedures

- Critical limit is a maximum and/or minimum value to which a biological, chemical, or physical parameter
- Each critical control point will have one more control measures to assure that the identified hazard is prevented, eliminated, or reduced

## Step 4. Determine Control Measures, Set Limits, and Establish Monitoring Procedures

- Monitoring should occur at critical control points to ensure they are in control (within critical limits)
- Monitoring can include visual inspection, temperature monitoring, residual disinfectant concentration monitoring, and water age considerations
- May include environmental sampling for non-potable systems such as cooling towers or decorative fountains (e.g. HPC)

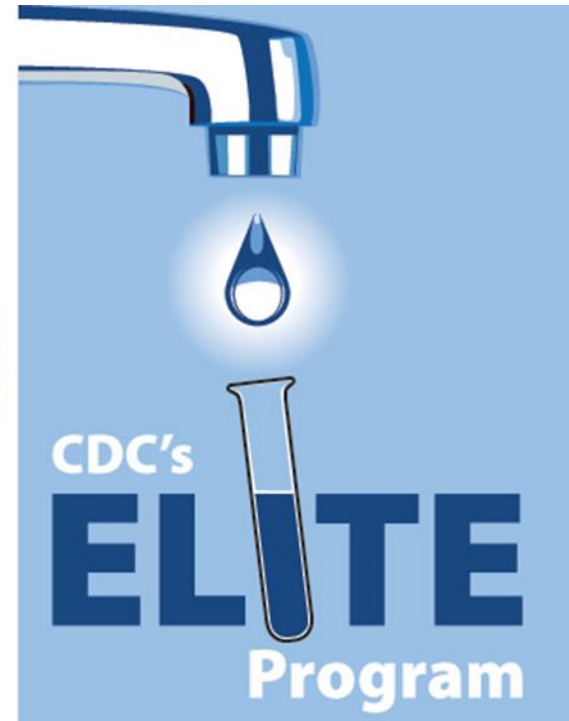
# Step 5. Intervention Responses for When Control Limits are Not Met

- Establish intervention responses for control limits for day-to-day operations and for when there is an incidence of disease, Legionella-positive environmental sample, or unplanned events
- Intervention responses should include short-term (e.g. water restrictions or point of use filters) and long-term (e.g. remove dead end piping)
- \*\*Ensure that if deficiencies are observed and intervention responses are implemented that communication occurs with the water management team (particularly infection prevention staff)\*\*



# Step 6. Establish Verification and Validation Procedures

- Verification
  - WQMP is being implemented as designed
  - People should not verify program activities they are responsible for
- Validation
  - WQMP is controlling *Legionella* as designed
  - Clinical surveillance for Legionnaires' disease
  - Environmental sampling for *Legionella*
    - Culture-based is the gold standard
    - CDC ELITE member laboratories
      - Environmental *Legionella* Isolation Techniques Evaluation
    - Sampling plans are unique to each facility



# Step 7. Establish Documentation Practices and a Communication Plan

- Document, document, document
- All records associated with the WQMP should be dated and signed or initialed by the person performing the action
- Maintain a current copy of the WQMP and all records of activities conducted under the WQMP including:
  - Monitoring logs
  - Flushing logs
  - Filter replacement logs
  - Intervention response records
  - Environmental sampling results



Remember an effective water management plan will address: amplification, aerosolization, and aspiration.

# Questions?

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