

Garratt-Callahan Company

WATER TREATMENT EXPERTISE SINCE 1904

Libby Ashworth

November 14th, 2023 – Greater Kansas City APIC Annual Business Meeting

Legionella, Water Management Plans, & ASHRAE 188



Agenda

- Water Safety Review & Risk Factors
- Tips for Water Safety Success
- Industry Updates (ASHRAE 514 & AAMI ST108)
- Questions



Why Consider Water Safety?

4x

The number of people with Legionnaires' disease grew by nearly 4 times from 2000–2014.

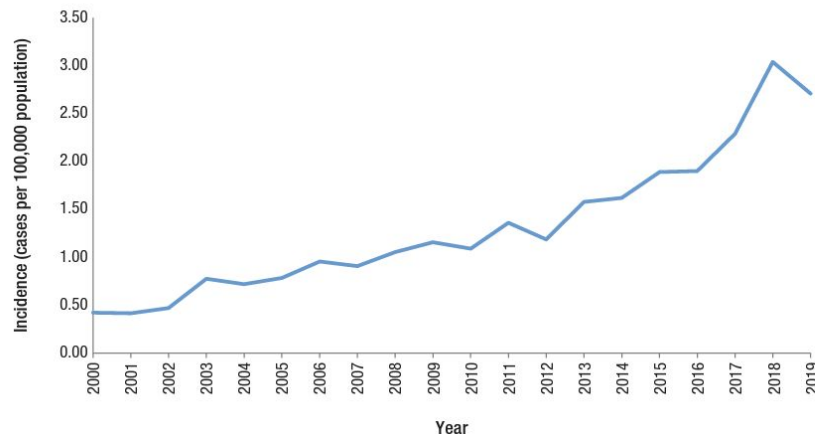
1 in 10

Legionnaires' disease is deadly for about 10% of people who get it.

9 in 10

CDC investigations show almost all outbreaks were caused by problems preventable with more effective water management.

Figure 1. Crude incidence^a rates of reported confirmed cases of Legionnaires' disease^b by year^c—NNDSS,^{d,e} United States, 2000–2019.



Why Consider Water Safety?

Patient at Hurley Medical Center diagnosed with Legionnaires' disease

By: Ryan Jeltema Jul 28, 2022 Updated Aug 16, 2022 0

NAPA

Napa Hotel Sued Over 2022 Legionnaires' Disease Outbreak

The lawsuit listed several defendants, including the Embassy Suites in Napa.

Family of man who got Legionnaires at UW Hospital is suing

By Associated Press Dec 2, 2021

More than two dozen sue over Legionnaires' outbreak at North Portland apartment complex

by KATU Staff | February 8th 2023, 7:17 PM CST



Water Management Teams

- Building owner
- Building manager/administrator
- Maintenance or engineering employees
- Safety officers
- Equipment or chemical suppliers
- Contractors/consultants
(e.g., water treatment professionals)
- Certified industrial hygienists
- Microbiologists
- Environmental health specialists
- State and local health officials

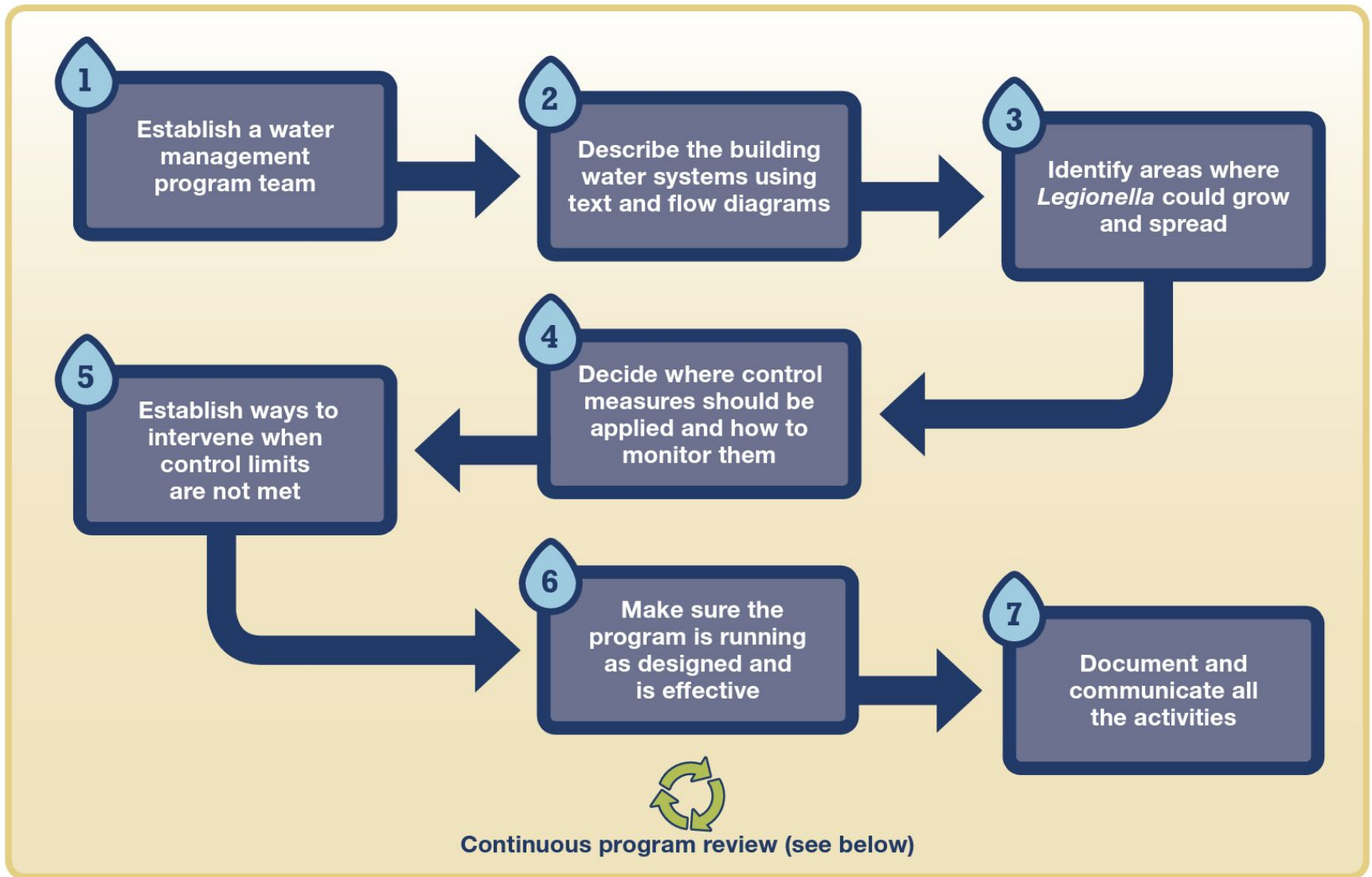
Healthcare Facilities

The team should also include:

- Someone who understands accreditation standards and licensing requirements
- Someone with expertise in infection prevention
- A clinician with expertise in infectious diseases
- Risk and quality management staff



Water Management Plans



Available Guidance

DEPARTMENT OF HEALTH & HUMAN SERVICES
Centers for Medicare & Medicaid Services
7500 Security Boulevard, Mail Stop C2-21-16
Baltimore, Maryland 21244-1850



Center for Clinical Standards and Quality/Quality, Safety and Oversight Group

DATE: June 02, 2017

Ref: *QSO-17-30- Hospitals/CAHs/NHs*
REVISED 07.06.2018

Facilities must have water management plans and documentation that, at a minimum, ensure each facility:

- Conducts a facility risk assessment to identify where *Legionella* and other opportunistic waterborne pathogens (e.g. *Pseudomonas*, *Acinetobacter*, *Burkholderia*, *Stenotrophomonas*, nontuberculous mycobacteria, and fungi) could grow and spread in the facility water system.



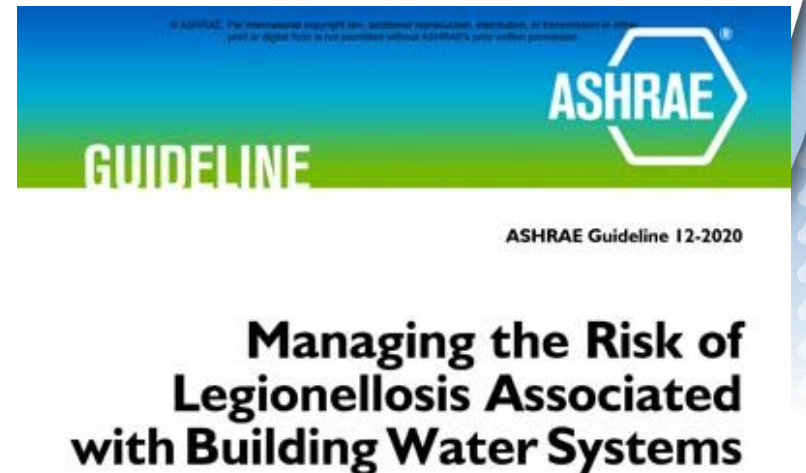
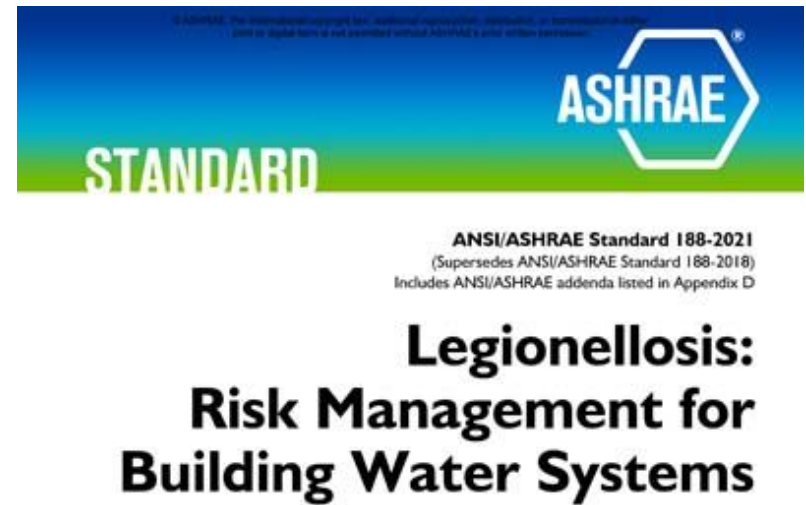
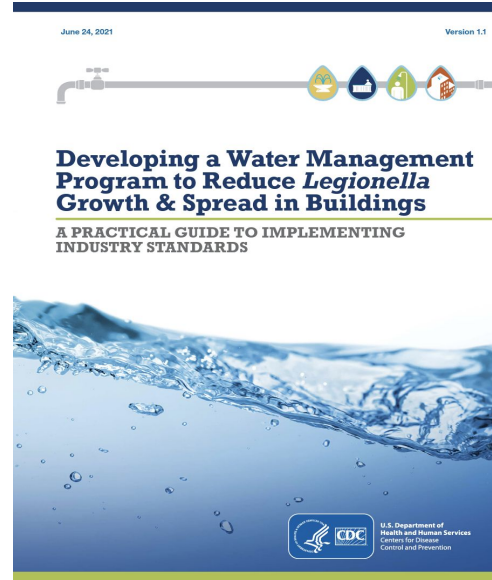
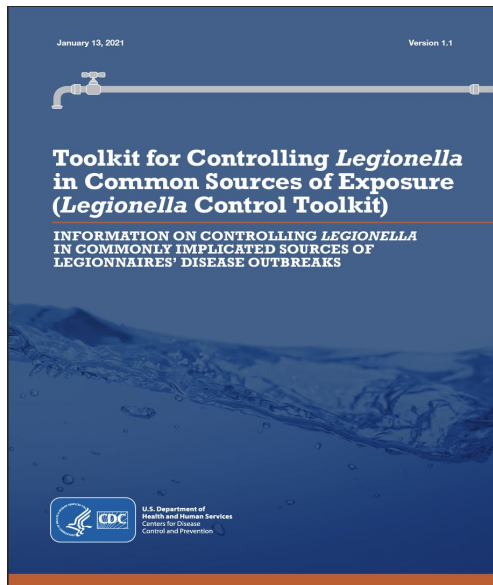
EC.02.05.02

The Joint Commission

New Standard for Water Management Program – Hospitals, Critical Access Hospitals, and Nursing Care Centers



Available Guidance



Legionella Bacteria Review

- Gram-negative bacterium
- Pathogenic
- 58 species (and counting)
- Free floating and lives/grows in biofilm



- Warm Water Conditions (<127F)
- Poor Water Flow
- Stagnant Water
- Spreads when water vapor mist is inhaled or aspirated

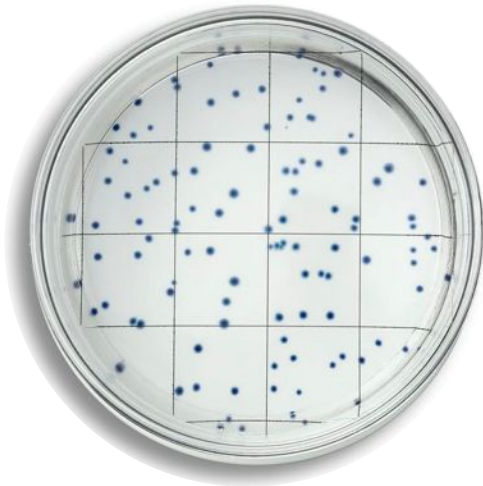
There is no “safe” level or type of Legionella (CDC Toolkit)



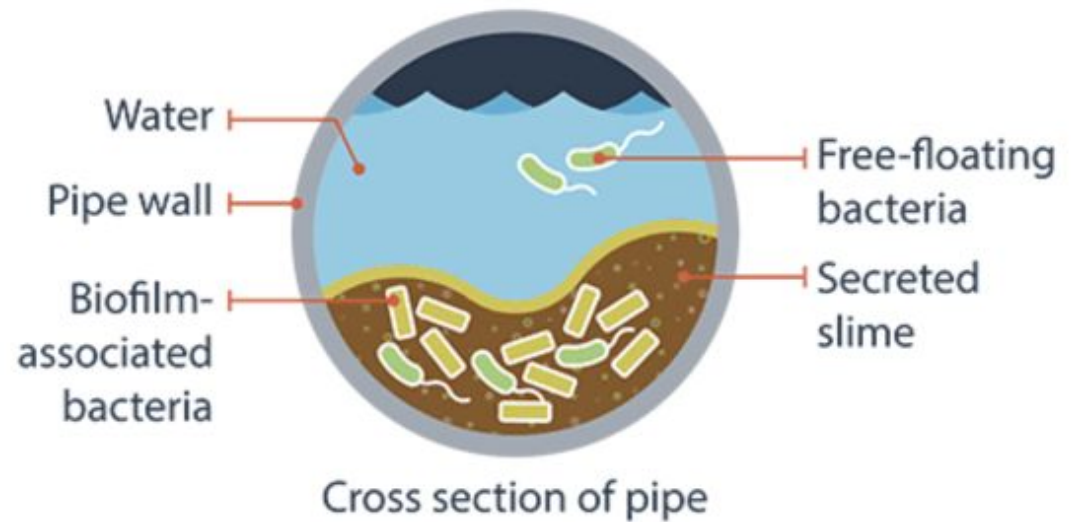
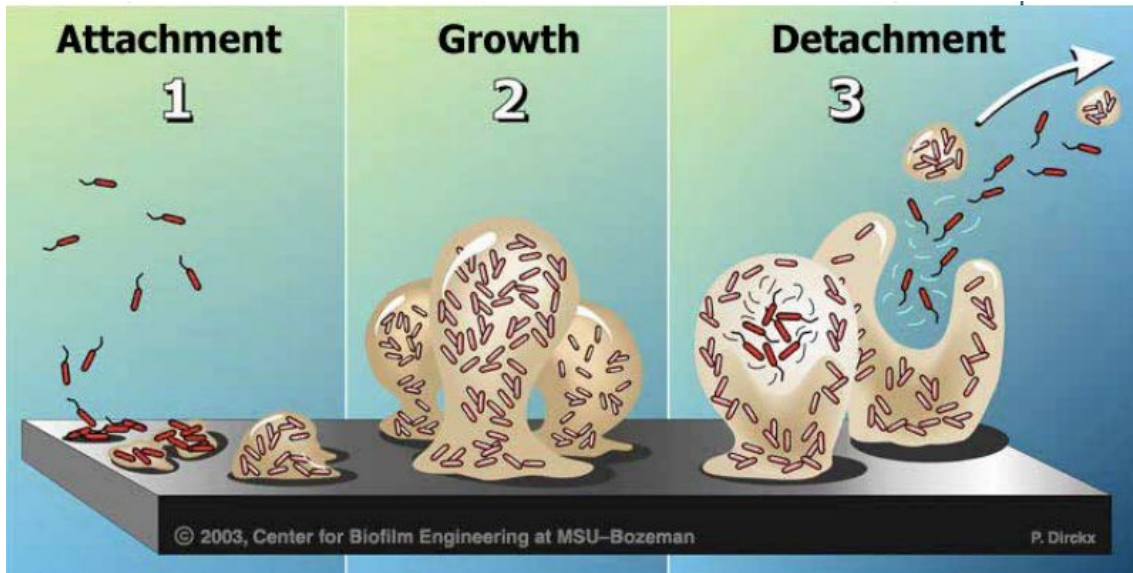
Other Waterborne Pathogens



- *Pseudomonas*, *Acinetobacter*, *Burkholderia*, *Stenotrophomonas*, nontuberculous mycobacteria and fungi (among others)
- HPC (general aerobic bacteria count) can be a good indicator of slime-formers



Biofilm



Stagnation



Stagnation Study

*Study performed on a sink
historically used 1-2x per month*

Day 1



Pre-Flush HPC
~500,000 CFU/mL



Day 2



Pre-Flush HPC
~10,000 CFU/mL



Day 3



Pre-Flush HPC
~2,500 CFU/mL



Post (5 min) Flush HPC
~500 CFU/mL



Post (5 min) Flush HPC
~250 CFU/mL



Post (5 min) Flush HPC
~250 CFU/mL

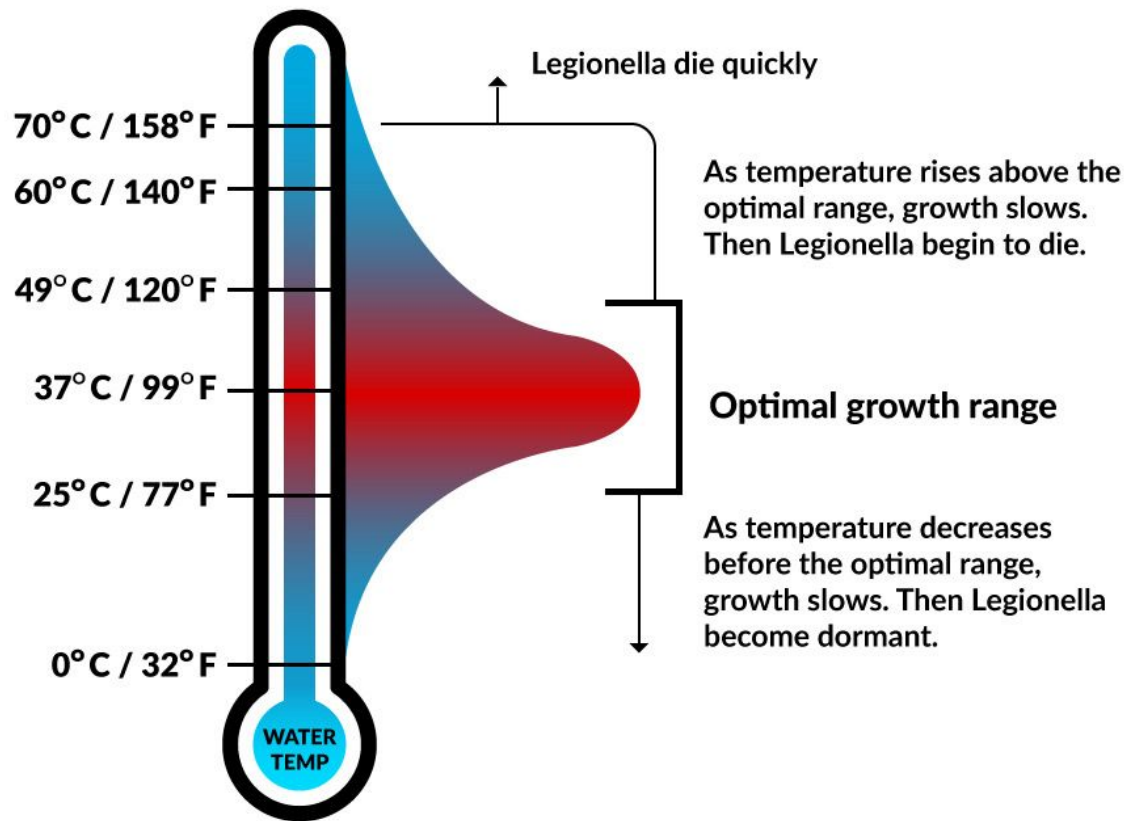


Stagnation Tips

- How long to flush?? Time how long it takes to get peak disinfectant residual.
- Utilize EVS/Housekeeping
- Identify low-flow areas, wings, floors, rooms...
Talk with nursing and unit staff!
- Automate!



Temperatures



Source: ASHRAE Guideline 12-2020 Figure 1 Temperature effects on survival and growth of Legionella in laboratory conditions

Most healthcare hot-water loops are in the ideal bacterial growth range – Limited by scalding risk/codes

Role of Environmental Legionella Testing

- Non-detect may not be achievable
- Goal = Reduce the risk and occurrence of clinical infections



The purpose of Legionella testing is to **validate** the water management plan and associated efforts

Figure 1. Routine *Legionella* testing: A multifactorial approach to performance indicator interpretation*^{oΔ}

Concentration indicates that *Legionella* growth appears:

Uncontrolled	Poorly Controlled	Well Controlled			
≥10 CFU/mL [†] in potable water	1.0–9.9 CFU/mL in potable water	Detectable to 0.9 CFU/mL in potable water	No <i>Legionella</i> detected in a single round of testing	No <i>Legionella</i> detected in multiple rounds of testing	No <i>Legionella</i> detected in multiple rounds of testing with methods that detect viable and non-viable bacteria of any <i>Legionella</i> species
OR ≥100 CFU/mL in non-potable water	OR 10–99 CFU/mL in non-potable water	OR Detectable to 9 CFU/mL in non-potable water			

Change in concentration over time indicates that *Legionella* growth appears:

Uncontrolled	Poorly Controlled	Well Controlled			
100-fold or greater increase in concentration (e.g., 0.05 to 5 CFU/mL)	10-fold increase in concentration (e.g., 0.05 to 0.5 CFU/mL)	<i>Legionella</i> concentration steady (e.g., 0.5 CFU/mL for two consecutive sampling rounds)	No <i>Legionella</i> detected in a single round of testing	No <i>Legionella</i> detected in multiple rounds of testing	No <i>Legionella</i> detected in multiple rounds of testing with methods that detect viable and non-viable bacteria of any <i>Legionella</i> species

Extent indicates that *Legionella* growth appears:

Uncontrolled	Poorly Controlled	Well Controlled			
Detection in multiple locations AND a common source location [‡]	Detection in a common source location that serves multiple areas	Detection in a few of many tested locations within a water system	No <i>Legionella</i> detected in a single round of testing	No <i>Legionella</i> detected in multiple rounds of testing	No <i>Legionella</i> detected in multiple rounds of testing with methods that detect viable and non-viable bacteria of any <i>Legionella</i> species
OR Detection across many locations within a water system	OR Detection in more than one location within a water system				

Type[§] of *Legionella* (species and serogroup) associated with Legionnaires' disease:

Highly Associated	Less Associated
<i>L. pneumophila</i> serogroup 1; Non-Lp1 <i>L. pneumophila</i> ; Presence of multiple different <i>Legionella</i> species or serogroups	Any non- <i>pneumophila</i> <i>Legionella</i> species including “blue-white” fluorescent <i>Legionella</i>

*This figure is intended for use during routine testing only. Test results are performance indicators and are not a measure of risk of human illness. This figure is not intended for use if a building or device is associated with Legionnaires' disease (LD) cases or an outbreak.

^oSee “Routine testing for *Legionella*” for guidance regarding suggested response activities. Comparable results may lead to different suggested response activities when other factors are considered (e.g., if there is evidence of poorly controlled growth at a healthcare facility).

^ΔConsidering the type of *Legionella* identified along with other *Legionella* testing performance indicators provides a clearer picture of water system control than the results of any single indicator. For example, facility owners and operators may consider implementing immediate interventions for a healthcare facility with: A. detectable but <10

colony-forming units per milliliter (CFU/mL), B. non-Lp1 *Legionella pneumophila*, C. observed at steady concentrations, but D. detected at multiple distal locations including a central water heater.

[†]Concentrations expressed as CFU/mL are for test results generated by traditional spread plate culture methods. If other test methods are used, consult testing lab or manufacturer instructions for appropriate interpretation.

[‡]Common source location examples include water heaters, hot water returns, storage tanks, and cooling tower basins.

[§]If a facility has a history of associated LD cases, then sequencing isolates obtained during routine testing may provide performance indicators regarding outbreak strain persistence (if that strain is detected).



U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

Example Legionella Response Matrix

Area	Limit (CFU/mL)	RECOMMENDED Minimum Corrective Action	Examples
Service	<1.0	No action or flush	Janitor's closets, mechanical rooms, service areas inaccessible to the public
	1.0 - 10	Flush	
	10.0+	Disinfect or replace fixture & flush	
Non-Patient Facing	<1.0	Flush	Soiled utility rooms, public waiting rooms, public restrooms, etc.
	1.0 - 10	Disinfect or replace fixture & flush	
	10+	Install POU filter, disinfect or replace fixture, & flush	
Patient Facing (inpatient and outpatient)	<1.0	Install POU filter, disinfect or replace fixture & flush	Patient room, nourishment room, ice machines, nursing stations; areas where patients or family members would potentially go
	1.0-10	Install POU filter, disinfect or replace fixture, flush, and resample	
	10+	Install POU filter, disinfect or replace fixture, flush, and resample	
High-Risk Patient Facing (inpatient and outpatient)	<1.0	Install POU filter, disinfect or replace fixture, & flush	High risk patient room, nourishment room, ice machines; areas where high-risk patients or family members would potentially go
	1.0 - 10	Install POU filter, disinfect or replace fixture, flush, and resample	
	10.0+	Install POU filter, disinfect or replace fixture, flush, and resample	

*Response may vary on a case-by-case basis based on guidance from facilities, infection prevention, and other members/consultants to the Water Management Committee.

Legionella Trending

Consider trending **both** positivity % and concentration

Other trending parameters:

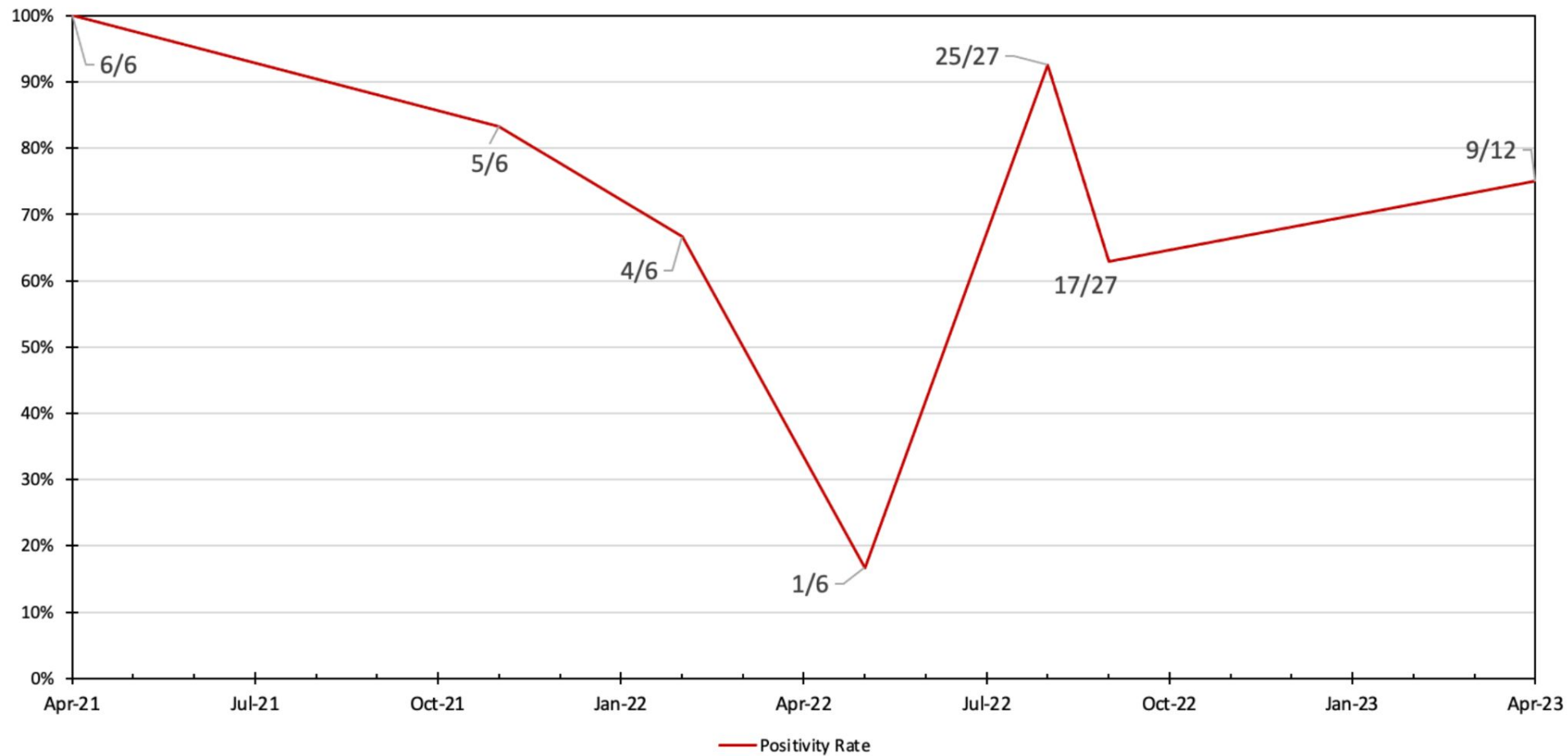
- By water system (HW, CW)
- By building, floor, unit, riser
- By outlet type (sinks, showers, ice machines)

Use all available data!

- Trend Legionella positivity alongside peak temperature, time to peak temperature, disinfectant...

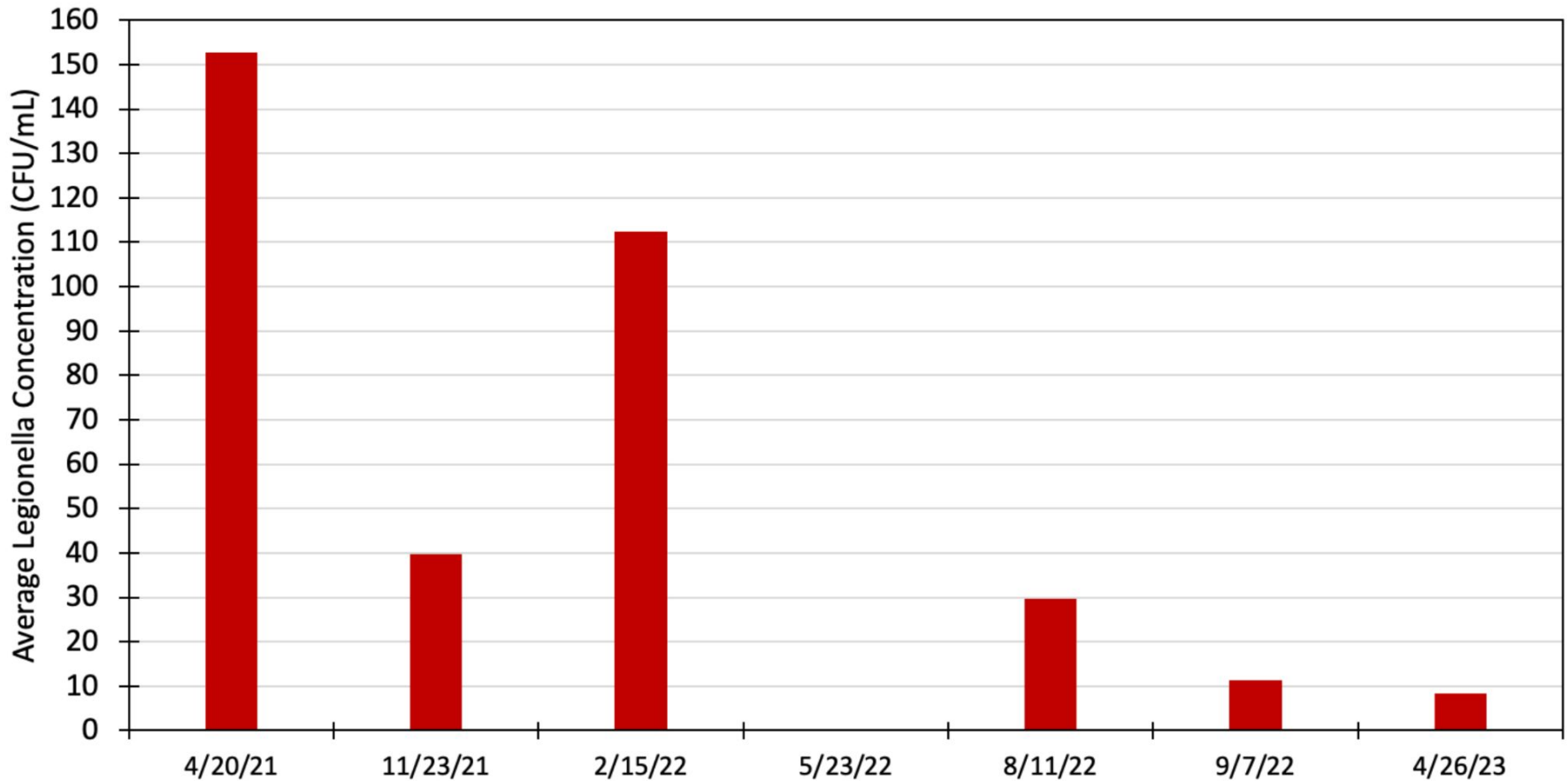


Example Legionella Positivity % Trend

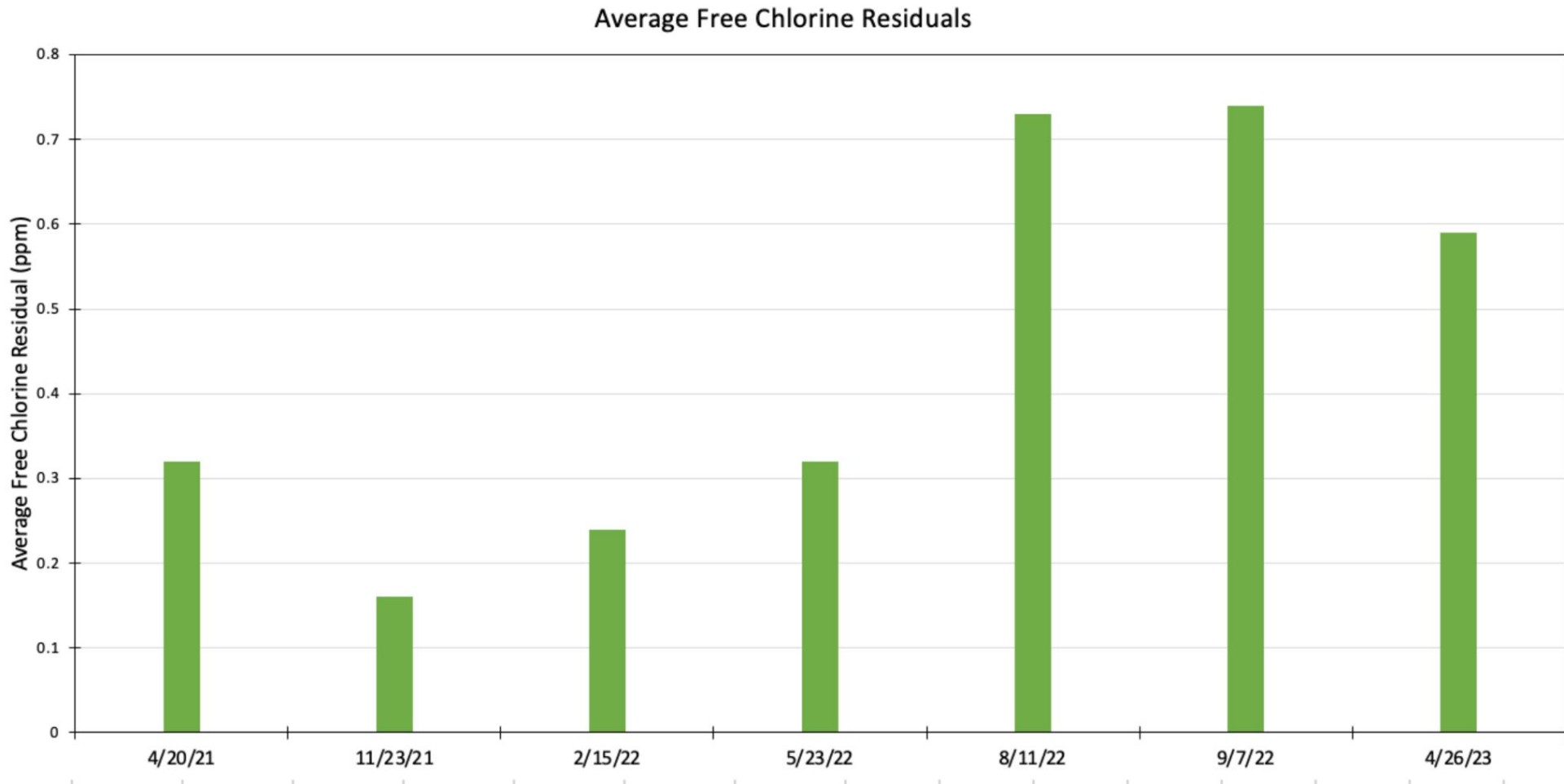


Example Legionella Concentration Trend

Average Legionella Concentration of Positives



Example Disinfectant Residual Trend



Documenting Water Testing Results

1. Develop and document action limits/ranges
(*Legionella*, other pathogens, disinfectant, temperature, etc...)
2. Perform testing
IF WITHIN RANGE: Document results.
IF OUT OF RANGE: Complete corrective action per WMP;
document results and action.
4. Retest to validate effectiveness of corrective action.
IF WITHIN RANGE: Document results.
IF OUT OF RANGE: Meet with Water Management
Committee to determine additional actions. Document.



Documentation to Include in your WMP

- Work orders for water management tasks (e.g., ice machine PMs, eye wash flushing)
- Water quality testing data (e.g., Legionella, disinfectant, temperatures)
- Control limits & ranges
- Corrective action documentation
- Policies and procedures
- Meeting minutes
- WICRA
- Flow diagram



CDC WICRA



WATER SOURCES

Patients are potentially exposed to water via the healthcare environment, equipment, or procedures. Water sources include, but are not limited to:

- Sinks
- Water source
- Sinks
- Drains
- Showers
- Toilets
- Hoppers
- Humidification devices
- Mechanical ventilators
- Endoscopes
- Heater cooler devices
- Ice machines
- Indoor decorative fountains
- Lactation equipment
- Enteral feeding
- Bathing procedures
- Oral care



MODES OF TRANSMISSION

When assessing risk of healthcare-associated infections caused by waterborne pathogens, consider the diverse modes of transmission, including:

- **Direct contact**
(e.g., bathing, showering)
- **Ingestion of water**
(e.g., consumption of contaminated ice)
- **Indirect contact**
(e.g., from an improperly reprocessed medical device)
- **Inhalation of aerosols dispersed from water sources**
(e.g., faucets with aerators)
- **Aspiration of contaminated water**
(e.g., use of tap water to flush enteral feedings)



PATIENT SUSCEPTIBILITY

Patient populations with compromised immune status, comorbidities, and exposure to certain procedures are more vulnerable to infections caused by waterborne pathogens. Units/wards/wings can be classified according to those patients treated in these areas:

- **Highest**
(e.g., BMT, solid-organ transplant, hematology, medical oncology, burn unit, NICU)
- **High**
(e.g., non-transplant ICUs, ORs)
- **Moderate**
(e.g., general inpatient units)
- **Low**
(e.g., waiting rooms, administrative office areas)



PATIENT EXPOSURE

In order to characterize patient exposure to water sources, consider a categorization scheme that encompasses factors such as the frequency (how often), magnitude (how much), and duration (how long) of exposure:

- **High**
(e.g., high frequency, magnitude, and duration)
- **Moderate**
(e.g., combination of high and low frequency, magnitude, and duration)
- **Low**
(e.g., low frequency, magnitude, and duration)
- **None**
(e.g., patients are not exposed to the water source)



CURRENT PREPAREDNESS

Consider how your WMP addresses different water sources, as determined by factors such as policies and procedures already in place, relevant staff practice, and implemented mitigation strategies.

- **Poor**
(e.g., limited policies and procedures, staff practice, and mitigation strategies)
- **Fair**
(e.g., some policies and procedures, staff practice, and mitigation strategies)
- **Good**
(e.g., robust policies and procedures, staff practice, and mitigation strategies)



CDC WICRA

Water Infection Control Risk Assessment (WICRA) for Healthcare Settings

Facility Name: Hospital A

Assessment Location: Burn ICU

Performed By (names): Jane Smith and John Doe

Assessment Date: 10/01/2020

WMP Team Role(s) (check all that apply):

☒ Hospital Epidemiologist/Infection Preventionist

☒ Facilities Manager/Engineer

☐ Environmental Services

☐ Compliance/Safety Officer

☐ Risk/Quality Management Staff

☐ Infectious Disease Clinician

☐ Consultant

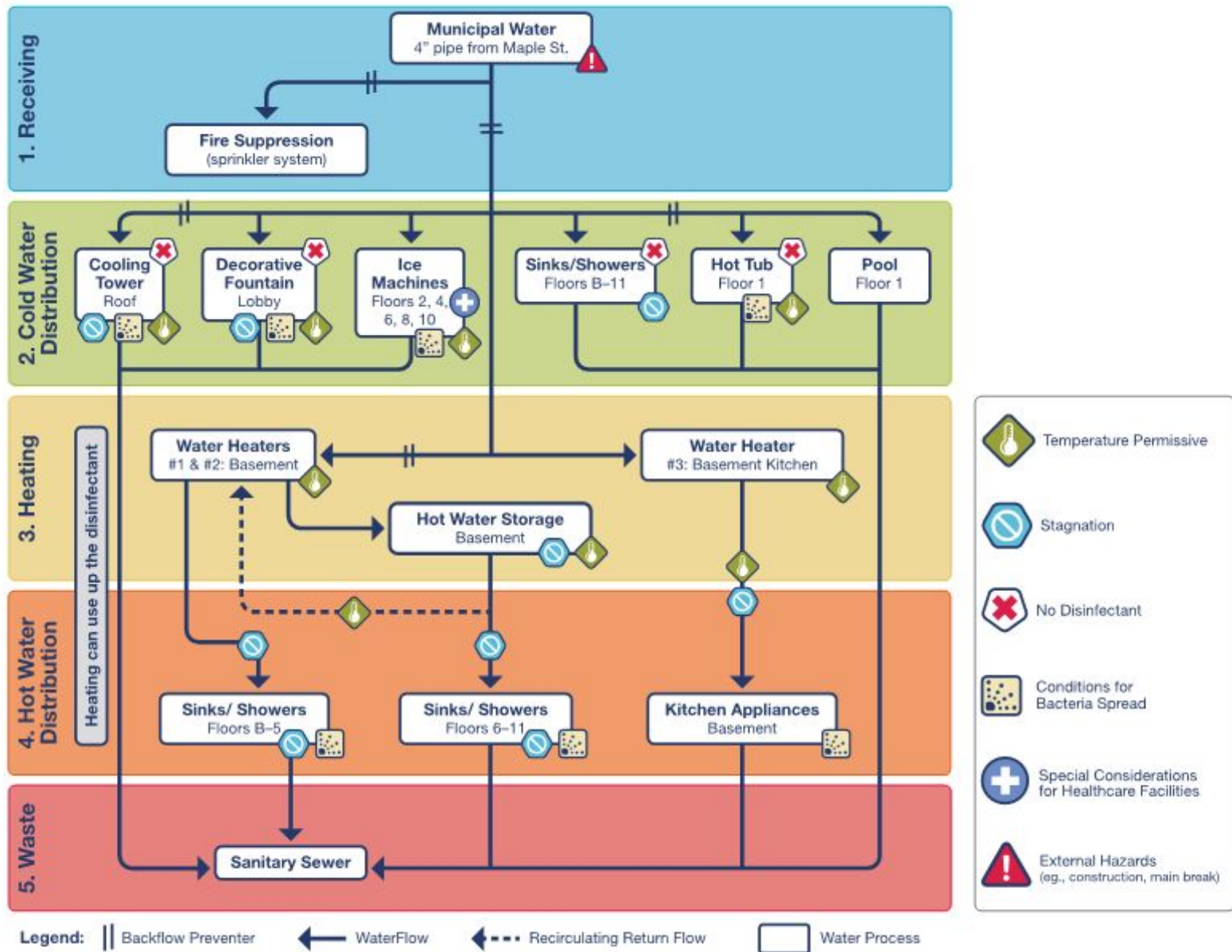
☐ Equipment/Chemical Acquisition/Supplier

☐ Other (please specify):

Location	Water Source	Modes of Transmission	Patient Susceptibility Highest = 4 High = 3 Moderate = 2 Low = 1	Patient Exposure High = 3 Moderate = 2 Low = 1 None = 0	Current Preparedness Poor = 3 Fair = 2 Good = 1	Total Risk Score = Patient Susceptibility x Patient Exposure x Preparedness	Comments
BICU Inpatient Rooms	Sink counter storage of patient care supplies	Indirect contact; splashing onto supplies	4	3	3	36	Install splash guards; QI for sink hygiene; and flushing
BICU Inpatient Rooms	Toilets without lid	Direct contact	4	3	2	24	Place lid on toilet if in patient room
BICU Soiled Utility	Hopper, no lid, behind closed door	Indirect contact	4	2	1	8	Automatic door closure; appropriate soiled equipment storage
BICU Medication Preparation Room	Sink with aerator, no splash guard	Aerosolization, and potential for splashing	4	2	3	24	Install splash guards; evaluate removing aerator

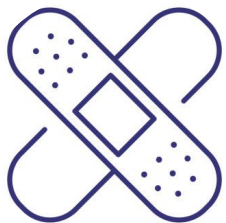


Flow Diagram – CDC Example



POU Filters

Your final line of defense against
Waterborne Pathogens



NOT a long-term solution!
Does not address root cause!
**A short-term solution while long-term
improvements are made**



Shower Hoses

Shower hoses provide ideal growth environment for bacteria

Consider:

- Hanging hoses to drain, or
- Exploring automatic-draining shower hose attachments



Sink Drains/Sink Design

Sink drains can become risk location for pathogens

Multicenter Study > Infect Control Hosp Epidemiol. 2018 Dec;39(12):1467-1469.

doi: 10.1017/ice.2018.191.

A multicenter investigation to characterize the risk for pathogen transmission from healthcare facility sinks

Scott A Gestrich¹, Annette L Jencson¹, Jennifer L Cadnum¹, Scott H Livingston¹, Brigid M Wilson², Curtis J Donskey³

Affiliations + expand

PMID: 30526714 DOI: 10.1017/ice.2018.191

Review > Clin Infect Dis. 2017 May 15;64(10):1435-1444. doi: 10.1093/cid/cix132.

The Hospital Water Environment as a Reservoir for Carbapenem-Resistant Organisms Causing Hospital-Acquired Infections-A Systematic Review of the Literature

Alice E Kizny Gordon¹, Amy J Mathers², Elaine Y L Cheong^{3 4}, Thomas Gottlieb^{3 4}, Shireen Kotay², A Sarah Walker^{1 5}, Timothy E A Peto^{1 5}, Derrick W Crook^{1 5}, Nicole Stoesser¹

Affiliations + expand

PMID: 28200000 DOI: 10.1093/cid/cix132

OPEN ACCESS | Research Article | 09 January 2019



Droplet- Rather than Aerosol-Mediated Dispersion Is the Primary Mechanism of Bacterial Transmission from Contaminated Hand-Washing Sink Traps

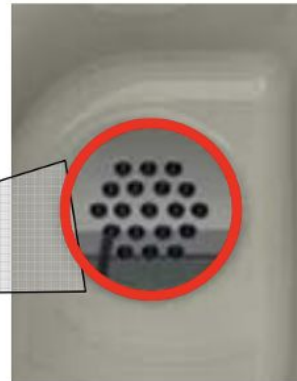
Authors: Shireen M. Kotay, Rodney M. Donlan, Christine Ganim, Katie Barry, Bryan E. Christensen, and Amy J.

Mathers | [AUTHORS INFO & AFFILIATIONS](#)



Sink Drains/Sink Design

- **Goal:** Minimize splashing and aerosols
- **Consider:** Splash guard, offset faucet discharge
- **Prioritize:** Sinks within 1m of patient beds or high-risk areas (e.g., med prep)



Aerator Design

- **Goal:** Minimize splashing and aerosols
- **Consider:** Laminar flow aerators
- **Prioritize:** Patient-Facing areas

Example of Aerated Flow Faucet



Example of Laminar Flow Faucet



Aerated Output



Laminar Output



		
Standard Aerator Draws up to 50% Produces Aerosols Bacterial growth on screen	Spray Aerator Produces a small shower Produces Aerosols Bacterial growth on screen	Non-Aerated Laminar Flow Does not mix air and water Reduced aerosols No surfaces for growth

Ice Machines

Annals of Internal Medicine

ORIGINAL RESEARCH

Mycobacterium abscessus Cluster in Cardiac Surgery Patients Potentially Attributable to a Commercial Water Purification System

Michael Klompas, MD, MPH; Chidiebere Akusobi, MD, PhD; Jon Boyer, ScD, CIH; Ann Woolley, MD; Ian D. Wolf; Robert Tucker, MPH, CIC; Chanu Rhee, MD, MPH; Karen Fiumara, PharmD; Madelyn Pearson, DNP; Charles A. Morris, MD, MPH; Eric Rubin, MD, PhD; and Meghan A. Baker, MD, ScD



IF POSSIBLE

Avoid Carbon Filter Systems:
Removes chlorine/disinfectant



Figure 1. Biofilm on ice and water machine tubing and inside the ice reservoir despite routine servicing per the manufacturer's instructions.



Other IP Considerations

Clinical Infections:

- How to respond?
- When to test for Legionnaire's Disease and other waterborne illnesses?
(POA vs. HAI)

Additional Water Applications:

- Humidifiers, CPAP, BIPAP, nebulizer, birthing tub, hydrotherapy, bronchoscopes, endoscopes, wound irrigation, dialysis...



ANSI/ASHRAE 514 – 7/25/23

“Risk Management for Building Water Systems: Physical, Chemical, and Microbial Hazards”



ANSI/ASHRAE Standard 514-2023

Risk Management for Building Water Systems: Physical, Chemical, and Microbial Hazards

Approved by the ASHRAE Standard Committee on June 24, 2023 and by the American National Standards Institute on July 25, 2023.

This Standard is under continuous maintenance by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the Standard. Instructions for how to submit a change can be found on the ASHRAE® website (www.ashrae.org/continuous-maintenance).

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- Supplementary standard to ANSI/ASHRAE 188-2018
- Broadened scope and new requirements



ASHRAE 514 vs. ASHRAE 188

Topic	ASHRAE 188	ASHRAE 514	Change
Risk (hazard) the WMP must reduce...	legionellosis (sections 1 and 6.1)	illness and injury from physical, chemical, and microbial hazards (section 1); overall risk of illness or injury from hazards associated with building water systems (5.1)	Broadened scope
Differences in building risk factors requiring additional management	Buildings... with 10+ stories housing occupants > 65 years of age	Buildings... • with > 6 stories • housing occupants < 2 years or > 65 years of age • with supplemental disinfection of potable water • with > 50,000 sq. ft. and a potable water booster pump • with an area for surgeries • for long-term residential health services (e.g., skilled nursing, physical rehab)	Includes additional building types
If any building risk factors apply...	legionellosis (i.e., Legionella) must be controlled in potable systems	physical, chemical, and microbial hazards must be controlled in all building water systems and devices	Broadened scope
Program team must have knowledge of building water systems related to...	legionellosis (6.2.1)	physical, chemical, and microbial hazards, and associated hazardous conditions (5.2.4)	Broadened scope
Water system descriptions must include...	end points processing equipment and components	• Utility's water quality report • Disinfectant in the water supply • "Identification, location, and description of all POU's" • Location and description of all water received and processed, including associated equipment	Added requirements

ANSI/AAMI ST 108 – 8/4/23

“Water for the Processing of Medical Devices”

- Applies to department that performs medical device reprocessing
- Minimum water quality testing requirements for:
 - Critical Water (e.g., RO, DI)
 - Utility Water
 - Steam
- **Step 1: Survey of Sterile Processing Department(s)**



**Navigating ANSI/AAMI
ST108:2023 - Guidance for
Water Quality**

December 11, 2023 | 1:00–3:00 PM ET



AAMI ST108 – Water Quality Parameters

Table 2—Categories and performance qualification levels of water quality for medical device processing

Water Quality Measurement	Units	Utility Water	Critical Water	Steam*
pH @ 25 °C:	pH	6.5 – 9.5	5.0 – 7.5	5.0 – 9.2**
Total Alkalinity	mg CaCO ₃ /L	<400	<8	<8
Bacteria	CFU/mL	<500***	<10	N/A
Endotoxin	EU/mL	N/A***	<10	N/A
Total Organic Carbon (TOC)	mg/L (ppm)	N/A	<1.0	N/A
Color and Turbidity	Visual	Colorless, clear, without sediment	Colorless, clear, without sediment	Colorless, clear, without sediment
Ionic Contaminants				
Aluminum	mg/L	<0.1	<0.1	<0.1
Chloride	mg/L	<250	<1	<1
Conductivity	µS/cm	<500	<10	<10
Copper	mg/L	<0.1	<0.1	<0.1
Iron	mg/L	<0.1	<0.1	<0.1
Manganese	mg/L	<0.1	<0.1	<0.1
Nitrate	mg/L	<10	<1	<1
Phosphate	mg/L	<5	<1	<1
Sulfate	mg/L	<150	<1	<1
Silicate	mg/L	<50	<1	<1
Total Hardness	mg CaCO ₃ /L	<150****	<1	<1
Zinc	mg/L	<0.1	<0.1	<0.1



Table 5—Frequency for water quality monitoring at water generation system

Water quality measurement	Type of testing	Routine monitoring sampling site	Minimum frequency of testing*	
			Utility Water	Critical Water
pH	pH meter** or Colorimetric dipsticks (sample tested within 15 minutes)	After the last treatment step	Quarterly	Monthly
Conductivity	Conductivity meter (in line or by measurement of a collected sample)	After the last treatment step, Storage tanks (if used)	Quarterly	Daily
Total Alkalinity	Colorimetric dipsticks Alkalinity test kit**	After the last treatment step, storage tanks (if used)	Quarterly	Monthly
Total Hardness	Determination of ppm as CaCO ₃ by Colorimetric dipsticks, Titration kit**, or Handheld meter**	After the last treatment step	Quarterly	Monthly
Bacteria	Heterotrophic plate count (see Annex H)	Loop out and loop return points	N/A	Monthly
Endotoxin	LAL test (see Annex H)	Loop out and loop return points	N/A	Monthly

Table 6—Frequency for water quality monitoring at point-of-water-use

Water quality measurement	Type of testing	Routine monitoring sampling site	Minimum frequency of testing*		
			Utility Water	Critical Water	Steam
pH	pH meter** or Colorimetric dipsticks (sample tested within 15 minutes)	At the point the distribution loop enters the processing area or first POU on the distribution loop	Quarterly	Monthly	Quarterly
Conductivity	Conductivity meter** or Colorimetric dipsticks	At the point the distribution loop enters the processing area or first POU on the distribution loop	Quarterly	Monthly	Quarterly
Total Alkalinity	Colorimetric dipsticks or Alkalinity test kit**	At the point the distribution loop enters the processing area or first POU on the distribution loop	Quarterly	Monthly	Quarterly
Total hardness	Determination of ppm as CaCO ₃ by Colorimetric dipsticks, Titration kit**, or Handheld meter**	At the point the distribution loop enters the processing area or first POU on the distribution loop	Quarterly	Monthly	Quarterly
Bacteria	Heterotrophic plate count (see Annex H)	Each location of point-of-use in department	Quarterly	Monthly	N/A
Endotoxin	LAL test (see Annex H)	Each location of point-of-use in department	N/A	Monthly	N/A
Visual Inspection	Visual Inspection of inside of equipment - Look for residue, staining, scaling, and discoloration (Annex I)	Spray Arms/Inside Chamber Walls/Inside Interior of Machine	Daily	Daily	Daily

Point-of-Water-Use

Examples:

- Cart washer
- Endoscope reprocessor
- Decontam. Faucets
- Autoclaves/steam sterilizers
- Ultrasonic Cleaners
- Instrument Washers



Conclusions

- Work as a team
 - Water safety responsibilities are shared between all members the Water Management Committee
- Document EVERYTHING
- Follow the data
- Consult the experts!





Libby Ashworth

Lashworth@g-c.com

Watersafetygroup@g-c.com

224-507-3336

