

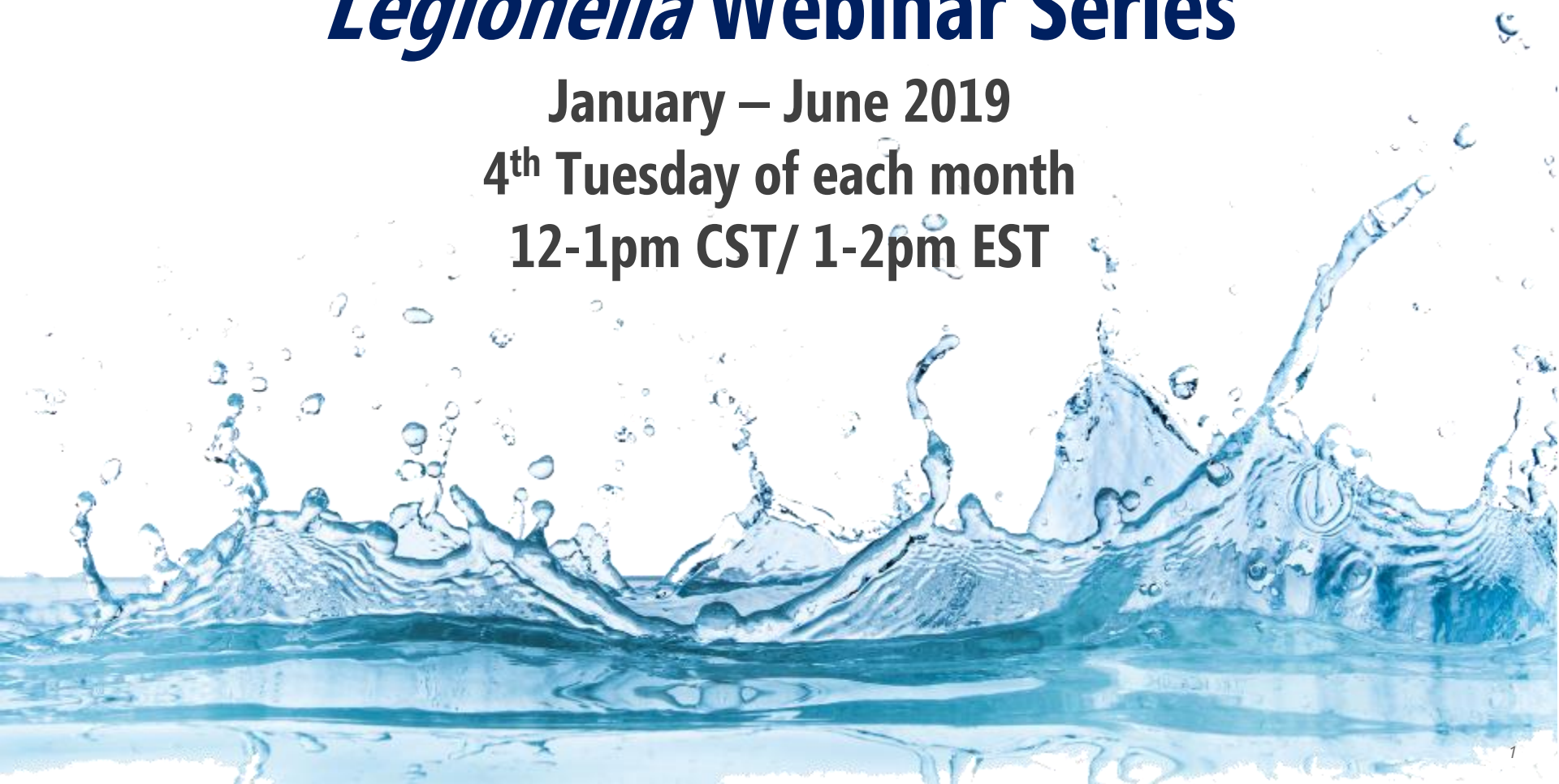


Legionella Webinar Series

January – June 2019

4th Tuesday of each month

12-1pm CST/ 1-2pm EST



Raise awareness of **Legionellosis** and prevention through **water management programs.**

Provide Tennessee healthcare facilities with information and resources to develop and implement water management programs.

Jan 22: **Introduction to Healthcare - Associated Legionellosis**

Feb 26: **Water Management Programs**

Mar 26: **Developing a Water Management Program**

Apr 23: **Healthcare Experiences with Water Management Programs**

May 21: **What to Expect in an Outbreak**

Jun 25: **Review Resources and Healthcare Implications**

Reminders

- **Webinars recorded, available online**
 - Previous webinar recording, slides, resources
 - <https://tha.com/events-education/legionella-webinar-series/>
- **Phone lines muted during webinar**
- **Questions taken at end**
 - Type in chat box

Phigenics Bias Disclosure



Phigenics chooses to be independent from profiting on the sale of water treatment products and services which conflict with our only bias:

Work with facility owners and managers to achieve defensible, data driven water management programs which verify and validate their building water systems are safe, efficient and cost-effective.

Free Resources

- **Webinars recorded, available online**
 - Previous webinar recording, slides, resources
 - <https://tha.com/events-education/legionella-webinar-series/>
- **CDC Toolkit**
 - <https://www.cdc.gov/legionella/wmp/toolkit/index.html>
- **CDC Prevent LD Training**
 - <https://www.cdc.gov/nceh/ehs/elearn/prevent-LD-training.html>

Major Take-aways

- **A WMP is only valuable if it is implemented and updated**
- **Verification and Validation Strategies should be used to ensure the program is being properly implemented and is achieving the goals of the Team**
- **No matter the size of the facility a cross functional team with authority to make decisions is necessary for success**
- **Documentation of all decisions and actions is needed for a defensible WMP**

Small Size Facilities (Up to 150 Beds)

Building Description

- 1 Floor 3 wing Building
- Overall bed count – 25
- 1 Hot Water Loop (Storage Tank)
- Rural Community Critical Access
- Non-Profit

Facility Goals

- Ensure compliance with ANSI/ASHRAE 188

Results and Actions

- Identified wing with low usage and potential risk with aging wooden cooling tower located near parking area.

Small Size Facilities (Up to 150 Beds)

Team Members

- Group Facilities Manager (Chair)
- Site Infection Preventionist
- Site Facility Supervisor
- Third Party Consultant



Small Size Facilities (Up to 150 Beds)

Team Findings

- Control locations were identified and High Risk Areas were identified
 - Heating
 - Distribution
 - Utility Water Cooling System



Small Size Facilities (Up to 150 Beds)

Justification

- Heating – Physical and Chemical Hazard
 - Scald risk due to temperatures above 120F
 - Loop has non-detectable oxidant levels
 - Storage of hot water increases the holding time in the loop for water.
- Distribution – Physical and Biological Hazard
 - Aerosolization possible in shower and sink heads
 - Low temperatures in storage and loop create ideal growth for bacteria
 - Low regular occupancy results in very elevated hold time in the hot water loop
- Utility water Cooling System
 - Location very near patient foot travel
 - Extremely old and under treated tower
 - Wood construction creates crevices in the tower for biofilm

Small Size Facilities (Up to 150 Beds)

Actions Required

- Team developed a hot water monitoring strategy to help prevent issues caused by low usage and low chlorine levels
 - Weekly flushing of furthest ends and documenting temperature and chlorine levels observed
 - Monthly flush of storage tank to prevent buildup of sediment
 - Increase loop temperature settings to >120F
- Team developed an oversight program of the water treatment company to ensure proper treatment of the cooling tower system
 - Daily In-house bromine level monitoring
- Quarterly Team Meetings Scheduled

Small Size Facilities (Up to 150 Beds)

Verification and Validation Strategies

- Full verification was determined to be required annually but all parameters to be discussed quarterly
- Validation strategy was selected to consist of *Legionella* testing and Total Heterotrophic Aerobic Bacteria in each of the 3 wings and cooling tower. In addition to the bacteria testing, chlorine residual and temperature testing is performed at all locations.

Small Size Facilities (Up to 150 Beds)

Results and Lessons Learned

- Validation testing identified sedimentation had occurred and resulted in high THAB levels as well as positive for *Legionella*. Team performed a shutdown to remove all sediment and identified project to remove tank.
- Smaller Facilities have typically less complex water systems but often aging equipment due to lower resources.
- Rural systems often have fluctuating occupancy which requires constant tracking and strong validation strategies to ensure a program is working.
- Due to low resources in smaller facilities it is vital to identify major needs or knowledge gaps and obtain assistance with those parts of a WMT.

Medium Size Facilities (150 – 500 Beds)

Building Description

- 8 Stories plus Penthouse
- Overall bed count – 414
- 3 Hot Water Loops
- Metropolitan Area
- Non-Profit

Facility Goals

- Perform Hazard Analysis to analyze risk and determine need for further action

Results and Actions

- Low Hot Water Chlorine Residual and Excessive Hold time in Cold Water Tanks
- Once Analysis was performed, Hospital identified previously unknown risks and sought to develop a program in accordance with proposed ASHRAE-188P.

Medium Size Facilities (150 – 500 Beds)

Team Members

- Facilities Manager (Chair)
- Powerhouse Plant Manager
- Senior Infection Preventionist
- Plumbing Supervisor
- Third Party Consultant



Medium Size Facilities (150 – 500 Beds)

Team Findings

- Control locations were identified and High Risk Areas were identified
 - Heating
 - Decorative Fountains
 - Distribution



Medium Size Facilities (150 – 500 Beds)

Justification

- Heating – Physical and Chemical Hazard
 - Scald risk due to temperatures above 120F
 - Loop has oxidant levels
- Decorative Fountains – Chemical and Biological Hazard
 - Fountains are known to have biological growth and aerosolization
 - Fountains are treated and overdosing could cause risk to patients
- Distribution – Physical and Biological Hazard
 - Cold Water held for extended periods of time in two tanks
 - Aerosolization possible in shower and sink heads
 - Low usage creates possible biological buildup in fixtures

Medium Size Facilities (150 – 500 Beds)

Actions Required

- Team developed a flushing strategy to help prevent issues caused by low usage and low chlorine levels
 - Three times per week flush bottom head of cold water tanks for 10 seconds
 - In rooms vacant more than 7 days flush out sink and shower for 3 minutes
 - Ensure loop temperature >120F
 - Record all work in central online database
- Team developed PM program to ensure documentation of all decorative fountain work by vendor

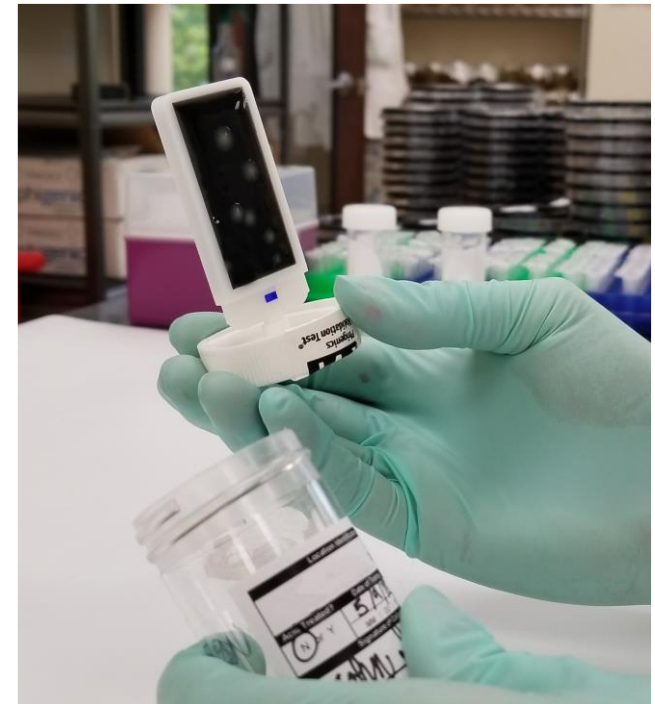
STEP 4: HEATING

1. Temperature at each hot water heat exchanger 120°F	1. Temperature gauge at each hot water heat exchanger	1. Once per week	1. Mechanically troubleshoot and repair specific hot water heat exchanger 2. Mechanically troubleshoot and repair HHW system	1. Once/week in applicable log or phiMetrics database	1. Maintenance Leads verify by checking log on weekly basis
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Medium Size Facilities (150 – 500 Beds)

Verification and Validation

- In verification it was identified that over the first quarter of implementation work was performed and logged properly
- In validation it was identified that of the 3 loops which had all previously been tested and detected for viable *Legionella* only the primary powerhouse loop appears to still be of concern



Response

- Upon receipt of the *Legionella* and bacteria test results the team decided to perform a major loop flush and return to the current program practices until further validation is performed
- Follow up validation was performed and no significant improvements were made either within bacteria count or oxidant levels

Medium Size Facilities (150 – 500 Beds)

Response (Cont.)

- Further oxidant testing was performed and determined that the loop was so large and underutilized that flushing would not provide adequate oxidant levels to remediate or mitigate the hazards.

Re-evaluation and Updating Program

- Team determined that the program would not be adequate without some form of additional oxidant in the Powerhouse Loop.
- Team looked into oxidant options and determined that chlorination with tablets was the best for this facility and concerns.
- Updated process flow diagrams and water use description to reflect chlorination as a critical control point.
- Set monitoring requirements and response for chlorination

Medium Size Facilities (150 – 500 Beds)

Results and Lessons Learned

- Positive *Legionella* tests lowered from 26% in 2012 to 1.2% in 2016.
- Utilization of a multi-functional WMT allowed for wide range of ideas to identify the optimal decisions for the hospital.
- Programs are intended to grow and change as the verification and validation show changes in the system.
- Do not rush to major facility changes based on testing but ensure that program is performed and that results are consistent then identify options.

Large Size Facilities (500+ Beds)

Building Description

- Main Campus of 105 Buildings
 - Two Large Hospitals
 - Research facilities
 - Classrooms
 - Laboratories
- 14,700,000 sq. ft
 - Served by 234 maintenance staff
- Some buildings are 150+ years old



Facility Goals

- Manage the risks to our patients associated with waterborne contaminants, both biological and corrosion related, in potable water systems.

Results and Actions

- Proactively established a water management to respond to flow and corrosion issues rather than a *Legionella* outbreak.

Large Size Facilities (500+ Beds)

Team Members

- Infection Control
- Industrial Hygiene
- Maintenance technicians,
- Supervisors
- Mechanical Engineers
- Third Party Consultant (Non-Voting)

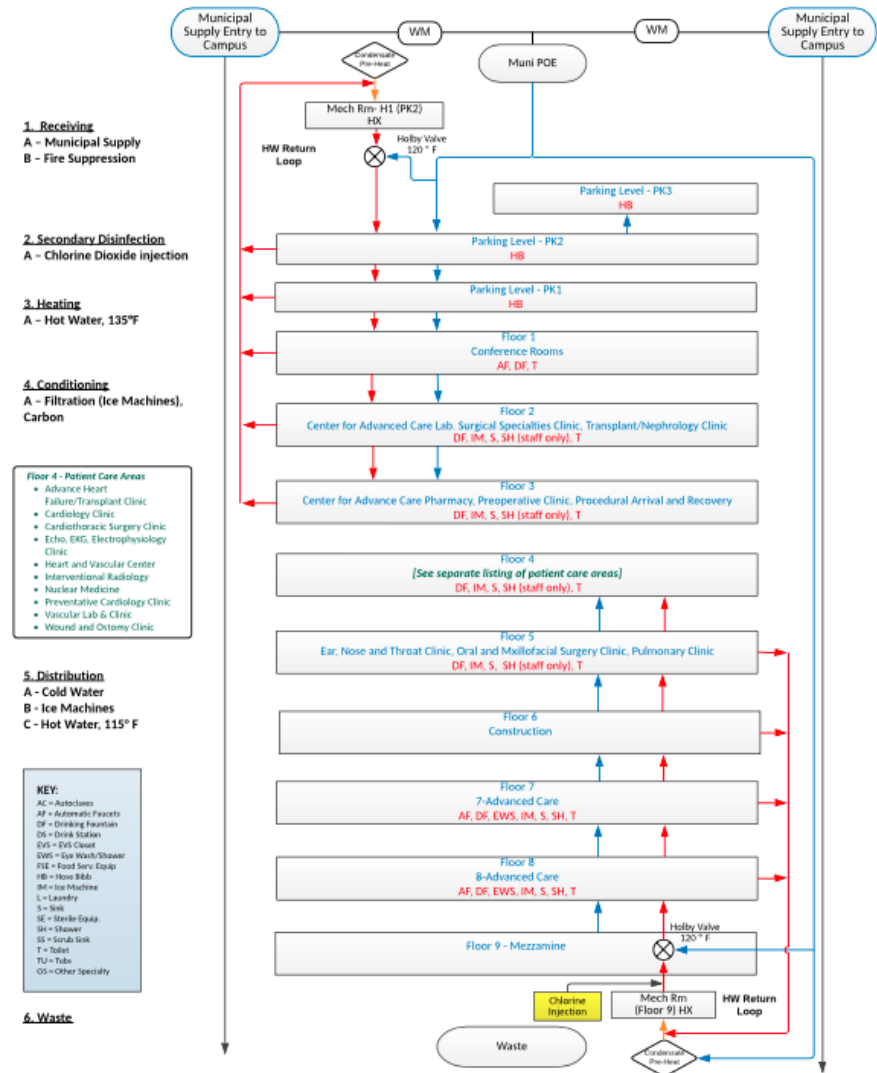


Large Size Facilities (500+ Beds)

Team Findings

- WMT created process flow diagrams for their complex system and reviewed them to identify hazards, characterize risks as significant or not, and determine if additional hazard control was needed.
 - Identified 7 “control locations”
- Performed a population-based risk assessment:
 - Immunosuppresses patients as a very high risk
 - Non-patient areas, like waiting rooms, low risk areas.

Potable Water Process Flow Diagram
(This does not depict a plumbing riser diagram)



Large Size Facilities (500+ Beds)

Actions Required

- Team developed control limits, chose monitoring methods, and set correction actions in advance.
 - Cold water distribution supplied between .2 and 1ppm of free residual chlorine continuously. Automatically monitored and tested at distal sites weekly.
 - Flushing program for system until free residual chlorine was in range.
 - Similar procedure for ice machines, water heaters, and a decorative fountain.
- All information was documented and accessible to all team members

Large Size Facilities (500+ Beds)

Verification and Validation

- Verified program was being implemented as designed through online logs, oversight from the team and a quarterly check-in meeting.
- For validation, established sample collection procedures and culture methods to detect and enumerate:
 - *Legionella*, Heterotrophic aerobic bacteria, Total coliforms, Escherichia coli, Pseudomonas spp., Pseudomonas aeruginosa, and Mycobacterium.



Response

- Out of 1,010, *Legionella* was detected in only 2.1%, far lower than the arbitrary 10% positive and far lower than the 30% positivity criterion sometimes advocated as “acceptable.”

Large Size Facilities (500+ Beds)

Results and Lessons Learned

- No *Legionella* detected in the potable water system or in patient hospital rooms after extensive independent environment investigations.
- A WMP can and should be created proactively, before a *Legionella* outbreak.
 - Allows for a defensible and rapid response
- Information and actions taken by the WMT per the instructions of the WMP should all be documented.
- Continuous improvement

White Paper and Panel Discussion can be found at the link below:

<https://info.phigenics.com/themayoclinic>

Enterprise System

Building Description

- Approximately 25 Medium/Large Acute Care Hospitals
- Multi-region system
- Stand Alone Buildings
- Behavioral Health
- Emergency Departments
- Ambulatory Surgery Centers

- **Goal:** Ensure the safety of patients, visitors and employees through defining process to manage environmental aspects of facility water systems

- **Results and Actions:** Established individual site Water Management Teams which roll up to a System Water Management Team which functions as a steering committee

Enterprise System

Corporate Steering Committee

- Corporate Director of Facilities
- Corporate Director of Infection Prevention
- Corporate Director of Environmental Risk and Emergency Management

Facility WMT Members

- Facilities/Plant Operations
- Infection Prevention
- Risk Management & Safety
- Quality Control
- Maintenance Technicians and Supervisors
- Third Party Consultant (Non-Voting)

Enterprise System

Team Findings

- Site Teams operate individually with facilitation of third party non-voting consultant
 - Control locations identified at a site level and commonly include:
 - Heating
 - Ice Machines
 - Hot & Cold Distribution
 - Decorative Water Features
 - Cooling Towers
- To drive progress and defensibility in decision making, a System WMT was established
 - Validation and Verification practices are driven corporately
 - Resulted in drafting System Water Management Policy

Enterprise System

Actions Required: *Sites selected frequency, locations, etc. for monitoring activities based on risk assessment

- Heating
 - Temperature and disinfectant monitoring
- Storage
 - Temperature and disinfectant monitoring
 - Flushing and cleaning
- Ice Machines
 - Preventative maintenance per manufacturer recommendations
 - Documentation of completion through PM System
- Hot & Cold Distribution
 - Disinfectant monitoring
 - Flushing of low use/low flow fixtures
- Decorative Water Features
 - Disinfectant monitoring
 - Visual inspection
- Cooling Towers
 - Disinfectant monitoring
 - Service vendor visits

Enterprise System

Verification

- Occurs at the site level on a quarterly basis
- Quarterly Verification Summary provided to System WMT

Validation

- Validation approach includes
- Total Heterotrophic Aerobic Bacteria (THAB)
- Legionella pneumophila and Spp.
- Frequency established based on corporate policy
- Flexibility to vary based on site-specific needs
- Validate facility water systems prior to opening new sites

Enterprise System

Response

- Upon detectable Legionella, validation response is completed
- Confirm program controls completed in accordance with Water Management Program
- May include flushing, cleaning/disinfection, changing of water lines/fixtures
- Complete retesting
- Regular validation frequency is increased based on detections
- Approach to elevated THAB results is evolving based on living-breathing status of WMP across enterprise

Re-evaluation and Updating Program

- *Program data reviewed to determine if changes are warranted to facility systems and Water Management Program
- Completion of annual review of site programs in accordance with ANSI/ASHRAE Standard 188
- Annual review of System Water Management Policy
 - Includes review of validation and verification approach

Enterprise System

Results and Lessons Learned

- Independent site teams which roll up to a System WMT allow organizational changes to be implemented
- Enterprise approach to water management:
 - Allows site teams to operate independently within a policy framework
 - Ensures unique facility conditions are captured but practices are consistent
 - Site teams are supported in their decision making and provided resources for program development



Questions?



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