



*Legionnaires' Disease: Epidemiology, Surveillance,  
and Water Management Programs to Reduce Risk*

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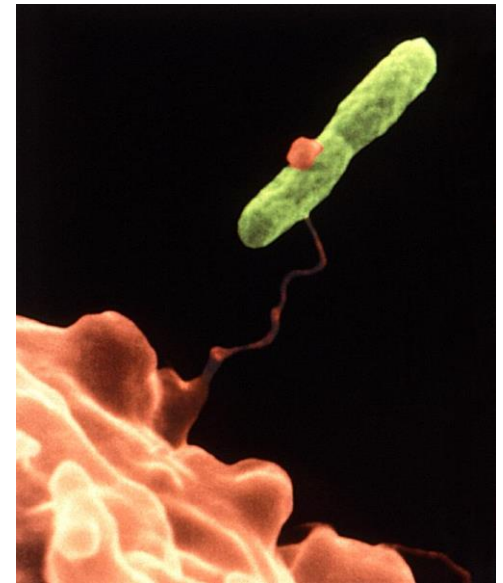
# *Outline*

- Background
- Case identification and case classification
- Reporting cases in NC EDSS
- Investigations
- Outbreak response and control measures
- Water management programs



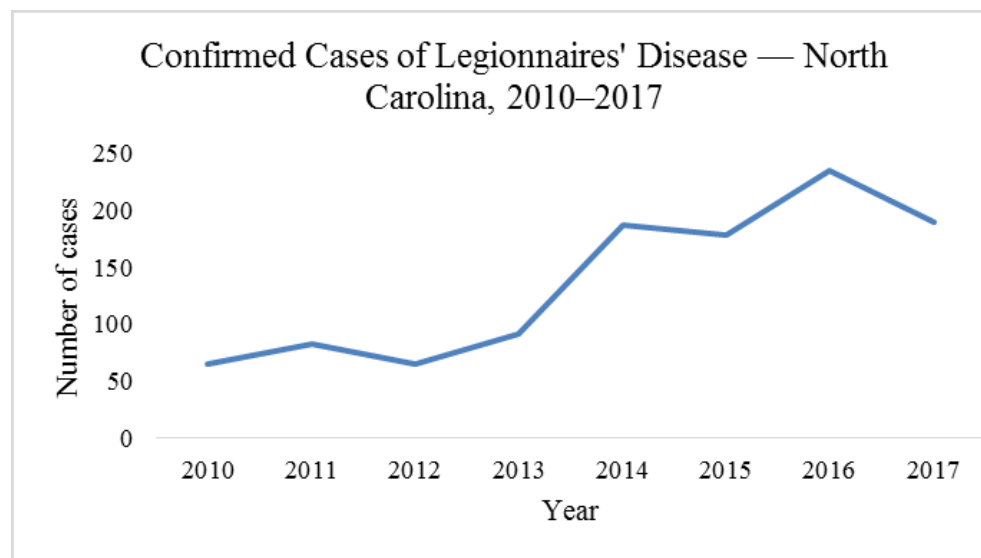
# Background

- Legionellosis
  - *Legionella* bacteria
  - Legionnaire's disease (pneumonia) v Pontiac fever (mild flu-like illness)
- Nationally notifiable since 1976
  - Outbreak at American Legion convention in Philadelphia
- Found naturally in freshwater
  - Ubiquitous
- When is it a health concern?
  - Can propagate in human made water systems
    - Breathing in contaminated water droplets
      - Mists, showering, splashing
  - Not spread person to person
  - No disease from drinking colonized water



## Background continued

- Who is at increased risk?
  - $\geq 50$  years
  - Smoking history
  - Underlying medical conditions:
    - Chronic lung disease, weakened immune system, cancer, diabetes, kidney failure, or liver failure
- Epidemiology
  - Incubation period: 2-10 days
  - Incidence increasing since 2000 in NC & US
    - 6,000 cases reported in US in 2015
    - ~200 cases reported in NC in 2017



# Diagnosis

- Urine antigen testing (UAT)
  - Most common
  - Only identifies infection by serogroup 1
- Serology
  - Likely second most common
  - Only useful with convalescent sample (3-10 weeks after initial result)
- Culture
  - Usually sputum or bronchoscopy specimen
  - Can have low sensitivity
  - 3-14 days to grow
- Polymerase chain reaction (PCR)
  - Not widely available, likely more common in the future
  - Potentially low sensitivity
  - Not FDA approved
  - Expensive
- Other
  - Other tests available: ICT, DFA, slide agglutination, Mab blotting, mass spectrometry, isothermal amplification
  - Used in conjunction with one of the above methods or uncommon



# Case Classification

- Clinical criteria:
  - Legionnaire's disease
    - Fever, myalgia, cough AND
    - clinical and/OR radiographic pneumonia
  - Pontiac fever:
    - Similar disease but milder and WITHOUT pneumonia

AND

- Laboratory criteria
  - Suspect:
    - Four-fold or greater increase in serology titer to a *Legionella* species or serogroup other than *L. pneumophila* serogroup 1
    - Detection of *Legionella* antigens in a respiratory specimen using DFA (rare)
    - Detection of *Legionella* species by PCR
  - Confirmed
    - Culture of any *Legionella* organism from a respiratory sample or normally sterile site
    - Positive UAT
    - Four-fold or greater increase in serology titer to *L. pneumophila* serogroup 1



# *Reporting Cases in NC EDSS*



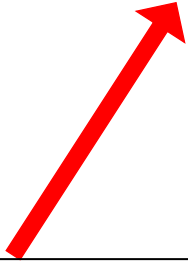
**LAB RESULTS:  
Serology**



# *Reporting Cases in NC EDSS*



**LAB RESULTS:  
Serology**



One serology result alone is not sufficient. In most cases, request a UAT.





# *Reporting Cases in NC EDSS*



**CLINICAL  
PACKAGE**



# Date that best reflects earliest date of illness identification

Period of Interest Timeframe	
FROM (10 DAYS PRIOR TO SYMPTOM ONSET): <input type="text"/>	UNTIL (SYMPTOM ONSET): <input type="text"/>
General Diagnostic Information	
Is / was patient symptomatic for this disease? <input type="checkbox"/>	<input type="checkbox"/>
<b>Date that best reflects the earliest date of illness identification</b>	<input type="text" value="MM/DD/YYYY"/>
Illness identification date represents:	<ul style="list-style-type: none"><li>Date symptoms began</li><li>Date of diagnosis by health care provider</li><li>Date of laboratory testing</li><li>Date of report to public health</li></ul>
Clinical Findings (Indicate each of the clinical findings that the patient had associated with illness, and complications)	
Fever	<input type="checkbox"/>
Fatigue or malaise or weakness	<input type="checkbox"/>
Loss of appetite (anorexia)	<input type="checkbox"/>
Chills or rigors	<input type="checkbox"/>
Headache	<input type="checkbox"/>
Muscle aches / pains (myalgias)	<input type="checkbox"/>
Cough	<input type="checkbox"/>
Pneumonia	<input type="checkbox"/>
Abdominal pain or cramps	<input type="checkbox"/>
Diarrhea	<input type="checkbox"/>
Clinical classification	<input type="text"/>



# Date that best reflects earliest date of illness identification

If known, report date symptoms began

Period of Interest Timeframe	
FROM (10 DAYS PRIOR TO SYMPTOM ONSET):	UNTIL (SYMPTOM ONSET):
General Diagnostic Information	
Is / was patient symptomatic for this disease?	<input type="checkbox"/>
<b>Date that best reflects the earliest date of illness identification</b>	MM/DD/YYYY
<b>Illness identification date represents:</b>	<input type="checkbox"/> Date symptoms began <input type="checkbox"/> Date of diagnosis by health care provider <input type="checkbox"/> Date of laboratory testing <input type="checkbox"/> Date of report to public health
Clinical Findings (Indicate each of the clinical findings that the patient had associated with the illness and complications)	
Fever	<input type="checkbox"/>
Fatigue or malaise or weakness	<input type="checkbox"/>
Loss of appetite (anorexia)	<input type="checkbox"/>
Chills or rigors	<input type="checkbox"/>
Headache	<input type="checkbox"/>
Muscle aches / pains (myalgias)	<input type="checkbox"/>
Cough	<input type="checkbox"/>
Pneumonia	<input type="checkbox"/>
Abdominal pain or cramps	<input type="checkbox"/>
Diarrhea	<input type="checkbox"/>
Clinical classification	<input type="checkbox"/>



# Clinical classification

## Clinical Findings (including signs, symptoms, diagnostic tests, and complications)

Indicate each of the clinical findings that the patient had associated with this illness.

Fever	<input type="checkbox"/>	▼
Fatigue or malaise or weakness	<input type="checkbox"/>	▼
Loss of appetite (anorexia)	<input type="checkbox"/>	▼
Chills or rigors	<input type="checkbox"/>	▼
Headache	<input type="checkbox"/>	▼
Muscle aches / pains (myalgias)	<input type="checkbox"/>	▼
Cough	<input type="checkbox"/>	▼
Pneumonia	<input type="checkbox"/>	▼
Abdominal pain or cramps	<input type="checkbox"/>	▼
Diarrhea	<input type="checkbox"/>	▼

Clinical classification

- Legionnaire's disease (pneumonia or pneumonitis)
- Pontiac fever (fever and myalgias without pneumonia)
- zz\_Unknown

## Comorbid Conditions

Indicate the predisposing conditions

Any immunosuppressive conditions	<input type="checkbox"/>	▼
Diabetes	<input type="checkbox"/>	▼



# Clinical classification

Clinical Findings (including signs, symptoms, diagnostic tests, and complications)	
Indicate each of the clinical findings that the patient had associated with this illness.	
Fever	<input type="checkbox"/>
Fatigue or malaise or weakness	<input type="checkbox"/>
Loss of appetite (anorexia)	<input type="checkbox"/>
Chills or rigors	<input type="checkbox"/>
Headache	<input type="checkbox"/>
Muscle aches / pains (myalgias)	<input type="checkbox"/>
Cough	<input type="checkbox"/>
Pneumonia	<input type="checkbox"/>
Abdominal pain or cramps	<input type="checkbox"/>
Diarrhea	<input type="checkbox"/>
Clinical classification	<input type="checkbox"/>
Indicate the predisposing conditions:	
Any immunosuppressive conditions	<input type="checkbox"/>
Diabetes	<input type="checkbox"/>

Comorbid Conditions	
Legionnaire's disease (pneumonia or pneumonitis)	<input type="checkbox"/>
Pontiac fever (fever and myalgias without pneumonia)	<input type="checkbox"/>
zz_Unknown	<input type="checkbox"/>

This item must be completed.



# Legionnaires' disease confirmed by CXR, CT scan?

Clinical Findings (including signs, symptoms, diagnostic tests, and complications) <span style="float: right;">+ Expand Details</span>	
Indicate each of the clinical findings that the patient had associated with this illness.	
Fever	<input type="text"/> ▼
Fatigue or malaise or weakness	<input type="text"/> ▼
Loss of appetite (anorexia)	<input type="text"/> ▼
Chills or rigors	<input type="text"/> ▼
Headache	<input type="text"/> ▼
Muscle aches / pains (myalgias)	<input type="text"/> ▼
Cough	<input type="text"/> ▼
Pneumonia	<input type="text"/> ▼
Abdominal pain or cramps	<input type="text"/> ▼
Diarrhea	<input type="text"/> ▼
Clinical classification <input type="checkbox"/>	Legionnaire's disease (pneumonia or pneumoniti) ▼ <a href="#">Add New</a>
Legionnaire's disease confirmed by CXR, CT scan?	<input type="text"/>
<b>Predisposing Conditions/Comorbid Conditions</b>	
Indicate the predisposing conditions that the patient had at the onset of this illness	
Any immunosuppressive conditions	<input type="text"/> ▼
Diabetes	<input type="text"/> ▼
Malignancy	<input type="text"/> ▼
Liver disease	<input type="text"/> ▼

- Yes
- No
- Unknown



# Legionnaires' disease confirmed by CXR, CT scan?

Clinical Findings (including signs, symptoms, diagnostic tests, and complications) <span style="float: right;">+ Expand Details</span>	
Indicate each of the clinical findings that the patient had associated with this illness.	
Fever	<input type="checkbox"/>
Fatigue or malaise or weakness	<input type="checkbox"/>
Loss of appetite (anorexia)	<input type="checkbox"/>
Chills or rigors	<input type="checkbox"/>
Headache	<input type="checkbox"/>
Muscle aches / pains (myalgias)	<input type="checkbox"/>
Cough	<input type="checkbox"/>
Pneumonia	<input type="checkbox"/>
Abdominal pain or cramps	<input type="checkbox"/>
Diarrhea	<input type="checkbox"/>
Clinical classification <input type="checkbox"/>	Legionnaire's disease (pneumonia or pneumoniti) <input type="checkbox"/> <a href="#">Add New</a>
Legionnaire's disease confirmed by CXR, CT scan?	<input type="checkbox"/>
Predisposing Conditions/Comorbid Conditions	
Indicate the predisposing conditions that the patient had associated with this illness	
Any immunosuppressive conditions	<input checked="" type="checkbox"/>
Diabetes	<input type="checkbox"/>
Malignancy	<input type="checkbox"/>
Liver disease	<input type="checkbox"/>

Yes  
No  
Unknown



This item must be completed. Cases are still reported, even if the answer is "No".



# *Reporting Cases in NC EDSS*



**RISK HISTORY  
PACKAGE**









## *Travel- and healthcare- associated cases*

- Cases are further classified as travel- or healthcare-associated
  - Travel-associated
    - Patients who traveled during the 10 days prior to symptom onset
    - Some additional information is required
    - Travel notifications
  - Healthcare-associated
    - Complex water systems
    - Susceptible populations
    - High case fatality rate
  - Definite
    - Exposure to a healthcare facility for the entire 10-day period prior to symptom onset
  - Possible
    - Exposure to a healthcare facility for part of the 10-day period prior to symptom onset



# *Did patient have a travel history during the period of interest?*

Period of Interest Timeframe	
FROM (10 DAYS PRIOR TO SYMPTOM ONSET): 	UNTIL (SYMPTOM ONSET): 
Travel / Immigration	
Would you like to view the definitions for residency labels?	<input type="checkbox"/> 
The patient is (choose most appropriate answer)	<input type="text"/> 
<b>Did patient have a travel history during the period of interest?</b>	<input type="text"/>
Does patient know anyone else with similar symptom(s) who had the same or similar travel history?	<input type="text"/>
Additional Travel/Residency information	<input type="text"/>

Yes  
No  
Unknown

# *Did patient have a travel history during the period of interest?*

Period of Interest Timeframe

FROM (10 DAYS PRIOR TO SYMPTOM ONSET):  UNTIL (SYMPTOM ONSET):

Travel / Immigration

Would you like to view the definitions for residency labels?

The patient is (choose most appropriate answer)

Did patient have a travel history during the period of interest?

Does patient know anyone else with similar symptom(s) who had the same or similar travel history?

Additional Travel/Residency information

For travel with lodging,  
include hotel name, specific  
dates, and room number(s)

# In what setting was the patient most likely exposed?

Travel / Immigration	
Would you like to view the definitions for residency labels?	<input type="checkbox"/> <input type="checkbox"/>
The patient is (choose most appropriate answer)	<input type="text"/>
Did patient have a travel history during the period of interest?	<input type="checkbox"/> <input type="checkbox"/>
Does patient know anyone else with similar symptom(s) who had the same or similar travel history?	<input type="checkbox"/> <input type="checkbox"/>
Additional Travel/Residency information	<input type="text"/>
<b>In what setting was the patient most likely exposed?</b>	<ul style="list-style-type: none"> <li>01. Restaurant or other food establishment</li> <li>02. Home</li> <li>03. Work</li> <li>04. Child care</li> <li>05. School</li> <li>06. University / college</li> <li>07. Camp</li> <li>08. Doctor's office / outpatient clinic</li> <li>09. Hospital In-patient</li> <li>10. Hospital Emergency Department</li> <li>11. Laboratory</li> <li>12. Long-term care facility / Rest home</li> <li>13. Military</li> <li>14. Prison / jail / detention center</li> <li>15. Place of worship</li> <li>16. Outdoors, including woods or wilderness</li> <li>17. Athletics</li> <li>18. Farm</li> <li>19. Pool or spa</li> <li>20. Pond, lake, river, or other body of water</li> <li>21. Hotel / motel</li> <li>22. Social gathering, other than listed above</li> <li>23. Travel conveyance (airplane, ship, etc.)</li> <li>24. International</li> <li>25. Community</li> <li>26. Other</li> <li>27. Unknown</li> </ul>
<b>DURING THE PERIOD OF INTEREST</b>	
During the timeframe displayed above, did the patient have...	
Does the patient know anyone else with similar symptoms?	
Does the patient work in a hospital?	
Was there known exposure (or opportunity for exposure)...	
During the period of interest, did the patient participate in...	
Was the patient interviewed?	



# *In what setting was the patient most likely exposed?*

Travel / Immigration	
Would you like to view the definitions for residency labels?	<input type="checkbox"/> <input type="checkbox"/>
The patient is (choose most appropriate answer)	<input type="text"/>
Did patient have a travel history during the period of interest?	<input type="checkbox"/>
Does patient know anyone else with similar symptom(s) who had the same or similar travel history?	<input type="checkbox"/>
Additional Travel/Residency information	
<b>In what setting was the patient most likely exposed?</b>	<ul style="list-style-type: none"><li>01. Restaurant or other food establishment</li><li>02. Home</li><li>03. Work</li><li>04. Child care</li><li>05. School</li><li>06. University / college</li><li>07. Camp</li><li>08. Doctor's office / outpatient clinic</li><li>09. Hospital In-patient</li><li>10. Hospital Emergency Department</li><li>11. Laboratory</li><li>12. Long-term care facility / Rest home</li><li>13. Military</li><li>14. Prison / jail / detention center</li><li>15. Place of worship</li><li>16. Outdoors, including woods or wilderness</li><li>17. Athletics</li><li>18. Farm</li><li>19. Pool or spa</li><li>20. Pond, lake, river, or other body of water</li><li>21. Hotel / motel</li><li>22. Social gathering, other than listed above</li><li>23. Travel conveyance (airplane, ship, etc.)</li><li>24. International</li><li>25. Community</li><li>26. Other</li><li>27. Unknown</li></ul>
<b>DURING THE PERIOD OF INTEREST</b>	
During the timeframe displayed above, did the patient	
Does the patient know anyone else with similar symptom(s)	
Does the patient work in a hospital?	
Was there known exposure (or opportunity for exposure)	
During the period of interest, did the patient participate	
Was the patient interviewed?	

For cases that are not healthcare-associated, this is usually be “community” or “unknown”.



# During the timeframe displayed above, did the patient have any of the following healthcare exposures?

Behavioral Risk and Congregate Living	
In what setting was the patient most likely exposed?	<input type="text"/> <input type="button" value="v"/>
Health Care Facility and Blood and Body Fluid Exposure Risks	
<b>DURING THE PERIOD OF INTEREST</b>	
During the timeframe displayed above, did the patient have any of the following health care exposures? (Add new for	
Other Exposure Information	
Does the patient know anyone else with similar symptoms?	<input type="text"/> <input type="button" value="v"/>
Does the patient work in a hospital?	<input type="text"/> <input type="button" value="v"/>
Water Exposure	
Was there known exposure (or opportunity for exposure) to aerosolized water in household, community or health care (medical or dental) settings?	<input type="text"/> <input type="button" value="v"/>

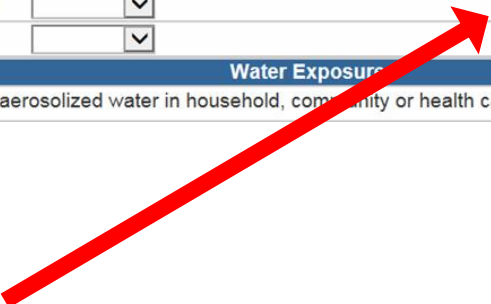
- Dental work or oral surgery
- Hospitalized
- Long term care facility - resident (e.g. nursing home, rest home, rehab)
- Outpatient facility - patient (e.g. urgent care, clinic, physician office)
- zz\_No
- zz\_Unknown



# During the timeframe displayed above, did the patient have any of the following healthcare exposures?

Behavioral Risk and Congregate Living	
In what setting was the patient most likely exposed?	<input type="text"/>
Health Care Facility and Blood and Body Fluid Exposure Risks	
<b>DURING THE PERIOD OF INTEREST</b>	
During the timeframe displayed above, did the patient have any of the following health care exposures? (Add new for	<input type="text"/>
Other Exposure Information	
Does the patient know anyone else with similar symptoms?	<input type="text"/>
Does the patient work in a hospital?	<input type="text"/>
Water Exposure	
Was there known exposure (or opportunity for exposure) to aerosolized water in household, community or health care	<input type="text"/>

- Dental work or oral surgery
- Hospitalized
- Long term care facility - resident (e.g. nursing home, rest home, rehab)
- Outpatient facility - patient (e.g. urgent care, clinic, physician office)
- zz\_No
- zz\_Unknown

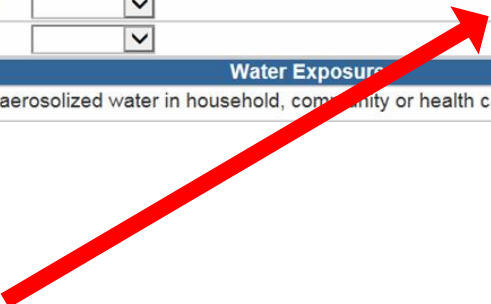


Only include healthcare exposures that happened before the patient became ill. Do not include hospitalizations due to Legionnaires' disease.

# During the timeframe displayed above, did the patient have any of the following healthcare exposures?

Behavioral Risk and Congregate Living	
In what setting was the patient most likely exposed?	<input type="text"/>
Health Care Facility and Blood and Body Fluid Exposure Risks	
<b>DURING THE PERIOD OF INTEREST</b>	
During the timeframe displayed above, did the patient have any of the following health care exposures? (Add new for	
Other Exposure Information	
Does the patient know anyone else with similar symptoms?	<input type="text"/>
Does the patient work in a hospital?	<input type="text"/>
Water Exposure	
Was there known exposure (or opportunity for exposure) to aerosolized water in household, community or health care	<input type="text"/>

- Dental work or oral surgery
- Hospitalized
- Long term care facility - resident (e.g. nursing home, rest home, rehab)
- Outpatient facility - patient (e.g. urgent care, clinic, physician office)
- zz\_No
- zz\_Unknown



“Dental work or oral surgery” or “Outpatient facility”

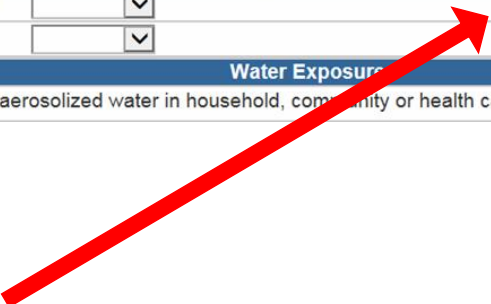
- Call the facility so they are aware that the patient was seen during their incubation period



# During the timeframe displayed above, did the patient have any of the following healthcare exposures?

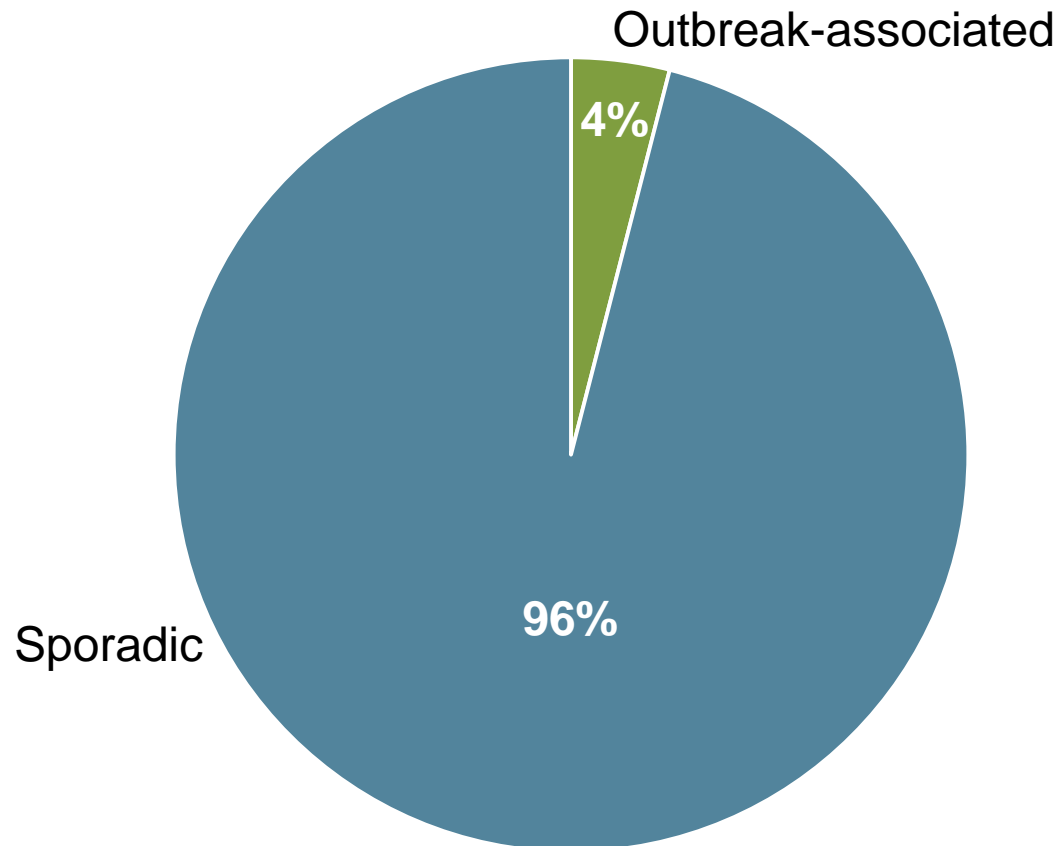
Behavioral Risk and Congregate Living	
In what setting was the patient most likely exposed?	<input type="text"/>
Health Care Facility and Blood and Body Fluid Exposure Risks	
<b>DURING THE PERIOD OF INTEREST</b>	
During the timeframe displayed above, did the patient have any of the following health care exposures? (Add new for	<input type="text"/>
Other Exposure Information	
Does the patient know anyone else with similar symptoms?	<input type="text"/>
Does the patient work in a hospital?	<input type="text"/>
Water Exposure	
Was there known exposure (or opportunity for exposure) to aerosolized water in household, community or health care	<input type="text"/>

- Dental work or oral surgery
- Hospitalized
- Long term care facility - resident (e.g. nursing home, rest home, rehab)
- Outpatient facility - patient (e.g. urgent care, clinic, physician office)
- zz\_No
- zz\_Unknown



“Hospitalized” or “Long term care facility” require additional follow up

# *Most reported cases of Legionnaires' disease in the US are not outbreak-associated*



# *Investigations & Outbreak Response*

- Detailed algorithm is located in the CD Manual
  - <http://epi.publichealth.nc.gov/cd/lhds/manuals/cd/legionella/LegionellosisAlgorithm.pdf>
- Sentinel case in a healthcare facility
  - Retrospective and prospective surveillance to identify additional cases
  - For definite healthcare-associated cases, conduct environmental assessment
- Outbreaks occur when two or more cases are in the same place at about the same time
  - Common settings
    - Buildings or structures with complex water systems
    - Hospitals, long term care facilities, hotels, resorts, cruises
  - Common exposure sources
    - Showering
    - Hot tubs/whirlpool tubs
    - Decorative fountains
    - Cooling towers



## *Recommended Control Measures*

- Conduct environmental assessment
- Initiate temporary water restrictions
- Install 0.2 micron point-of-use filters
- Collect environmental samples
- Continue active surveillance
- Communication with residents, patients, families, visitors, staff
- Hire expert consultant



# *Prevention*

- Provider awareness
- Use and cleaning of respiratory therapy equipment
- Development and implementation of water management programs



# *Water Management Plans in Healthcare*



# *What is a water management plan?*

- Policies and practices that
  - Reduce the potential for *Legionella* bacteria (and other waterborne pathogens) to amplify in building water systems
  - Reduce potential building occupants to be exposed to water containing *Legionella* bacteria (and other waterborne pathogens) air.
- A multi-step continuous process

# *Why do healthcare facilities need water management plans*

- Legionnaire's disease is preventable
- Regulatory requirements
  - Center for Medicaid and Medicare Services (CMS)
  - <https://www.cms.gov/Medicare/Provider-Enrollment-and-Certification/SurveyCertificationGenInfo/Downloads/Survey-and-Cert-Letter-17-30.pdf>
  - Veterans Health Affairs (VHA)
  - State of New York and New York City
- Industry Best Practices – American Society of Heating Refrigeration and Air-Conditioning Engineers (ASHRAE) Standard 188 plus others
- Government Recommendations -- CDC and WHO plus other states
- Get the most from private consultants and contractors






## *Get the most from outside help*

- Water management is a growth industry, expect to be solicited by contractors and consultants offering products and services
- Consultants and contractors need to be partners in the process with an understanding about specifics of the facility
- When selecting contractors or consultants consider
  - Experience
  - Knowledge of codes standards and regulations
  - Conflicts of Interest
- CDC, Considerations when working with Legionella Consultants  
<https://www.cdc.gov/legionella/maintenance/consultant-considerations.html>



# *Elements of a Water Management Plan*

- Form a water management team
  - Facility risk assessment
  - Describe and document water systems in detail
  - Water systems risk assessment
  - Identify control methods
  - Identify control points and how to monitor them
  - Plan for nonroutine situations
  - Verify and update plans
- 
- Recordkeeping
  - Documentation
  - Communication
  - Engagement

# *Water management team*

- Team is interdisciplinary across organization and may include partners
- Team members need
  - Knowledge skills and abilities to recognize hazards
  - Ability to take prompt corrective measures
- Documentation and recordkeeping
- Integrate into existing programs policies and procedures

## Main team

- Facility director
- Facility administrator
- Medical Director
- Health and safety
- Infection control
- Environmental services
- Chief engineer
- Maintenance director

## As needed

- Finance
- Human resources
- Legal
- Public affairs
- Contractors & consultants
- Local water supplier
- Regulators



# *Facility Risk Assessment*

## Occupant characteristics

- Age
- Pre-existing disease
- Immune status

## Interactions with

- Accreditation standards and licensing requirements
- Infection control
- Clinical services
- Construction, operations, maintenance
- Environmental services
- Safety and health

## Building Characteristics

- Age/condition of building
- Age/condition of water systems
- Places in water systems where legionella could amplify or biofilms could form
- Places in water systems that create aerosols
- Existing maintenance and management plans
- Staff knowledge & Expertise
- Variability of occupancy rates
- Future plans, changes in use, additions, renovations



# *Describe water systems*

- Flow charts, architectural plans, engineering diagrams, written descriptions, interviews and other records
  - Hot and cold potable water systems
  - Process water systems
  - Medical water systems
  - Waste water
  - Reused water
  - How water is discarded
- Describe and document
  - Points where water enters the building
  - How water is distributed and circulated
  - How water is processed
  - How water is used
    - Consider volume, duration and frequency of water use, future uses or installation of new equipment



# *Points of entry & How water is distributed and circulated*

Know your public water supply and where water enters the building

How water is distributed and circulated

- Piping
- Valves
- Fittings
- Storage tanks
- Pumps
- Fixtures(outlets)
- Backflow prevention
- Cross connection prevention
- Thermostatic mixing devices
- Meters
- Gaskets
- Filters
- Strainers
- Aerators
- Shower heads



# *How water is processed*

- Heated
- Cooled
- Stored
- Disinfected
- Distilled
- Purified
- Pressurized
- Filtered
- Mixed
- Or otherwise treated



## *How water is used*

- Food preparation and sanitation
- General patient care, showering, bathing, handwashing
- Housekeeping and environmental services
- Laundry and environmental services
- Drinking fountains and ice machines
- Fire suppression/emergency eyewash
- Process water, heating & cooling -- cooling towers
- Decorative fountains
- Pools, spas and hydrotherapy
- Landscaping
- Ultra clean water -- hemodialysis, surgical irrigation, laboratories, pharmacy, respiratory therapy
- Dental
- Others?

How water is discarded – wastewater and sanitary sewer





## *General control methods*

- Prevent backflows, cross connections or other sources of external contamination
- Limit places where water temperature is optimal for legionella to amplify while prevent scalding hazards
- Maintain pH and residual disinfectant levels throughout water systems
- Maintain water heaters and storage tanks at appropriate temperatures
- Keep decorative fountains clean, or eliminate them
- Routine cleaning and disinfection, shower heads, faucets, ice machines, drinking fountains
- Routine cleaning and disinfection of respiratory therapy and other medical equipment
- Routine flushing infrequently used water lines



## *Identify control points*

- Locations where temperature is in optimum range for range for *Legionella* amplification (95°F to 115°F)
- Locations where water is recirculated or stored
- Places with dead legs, where water may stagnate, reduced flow or water is infrequently used
- Places where biofilms are may form
- Places and uses where droplets or aerosols are generated
- Water fountains and ice machines
- Medical equipment
- Construction activities that disrupt water system
- Other incidents that might disrupt water systems



## *Qualitative monitoring of control points*

- *Routine inspections for rust, sludge, organic matter, biofilms, sediment, scale, unusual turbidity and unusual odor*
- Routine maintenance of plumbing system components
- Routine filter changing
- Routine flushing hot and cold water outlets
- Routine, standardized, and documented protocols for cleaning and disinfecting fixtures (outlets) and equipment
- Identification and elimination of dead legs
- Identifying places where water is used infrequently
- Notification process for intended/unintended disruption of water



# *Quantitative monitoring*

- Routine measurements at points of entry
  - Temperature
  - pH
  - Residual disinfectant levels
- Routine measurements at control points & points of use
  - Temperature
    - Hot water systems  $>140^{\circ}$  in storage tanks and  $> 124^{\circ}\text{F}$  in distribution piping
    - Temperature limits at point of use (100 to  $116^{\circ}\text{F}$ ) for lavatories and bathing facilities
    - Cold water systems  $< 67^{\circ}$  minimum to extent practicable
  - pH
  - Residual disinfectant levels



## *Options when control limits are not met*

- Cleaning and disinfection
- Thermal shock treatment
  - Set hot water to greater than 160° F and flush each outlet for at least 30 minutes
- Shock disinfection
  - Increase residual chlorine to at least 2 mg/liter and maintain throughout the system by continuous flushing for at least two hours
- Point of use filtration – installed on showers and faucets consider when other methods are not feasible and/or for high risk patients
- Tie into facility emergency water plan



## *Verify program is working*

- Is facility meeting control limits?
- Track incidents when control limits are not met
- Investigations and after action reviews
- Engage affected workers
  - Are practices and operations feasible given available resources and work flow
  - Other resources need to programAsk for recommendations for changes to practices & procedures to
  - Improve worker safety
  - Reduce number and severity of incidents when control limits are not met
- Document costs for interventions when control limits are not met



## *Labels, record keeping, and documentation*

- Keep water networks, systems, components and equipment labelled in a clear and uniform manner
- Set up standardized and useful record keeping systems about inspections and corrective actions at control points
- Keep previous versions of water management plans as new plans are updated
- Keep water management team meeting minutes
- Encourage and keep records from affected workers about the performance of program



# *To sample or not to sample routinely for legionella*

## **Sampling for Legionella**

- Environmental sampling is the only way to validate effectiveness of water management plan
- A decision to routinely sample for legionella as part of the water management plan should be a carefully and deliberately considered by the by the water management team
- *Do not conduct unplanned, unsystematic or undirected sampling*

## **If routine sampling is part of the plan:**

- *Go All out !!!*
- Non random
- Part of a carefully designed sampling plan
- Set goals
- Set threshold limits for corrective actions
- Devote enough resources
- Work out technical concerns
- Select appropriate laboratories





# *Online references*

CDC vital signs– Legionnaires Disease a problem for health care facilities  
<https://www.cdc.gov/vitalsigns/legionella/index.html>

Developing a Water Management Program to Reduce Legionella Growth & Spread in Buildings, A Practical Guide to implementing Industry Standards  
<https://www.cdc.gov/legionella/downloads/toolkit.pdf>

Healthcare Water Management Program Frequently Asked Questions  
<https://www.cdc.gov/legionella/water-system-maintenance/healthcare-wmp-faq.html>

Considerations When Working with Legionella Consultants  
<https://www.cdc.gov/legionella/maintenance/consultant-considerations.html>

Centers for Medicare & Medicaid Services, S&C 17-30, 06/09/2017 Requirement to Reduce Legionella Risk in Healthcare Facility Water Systems to Prevent Cases and Outbreaks of Legionnaires' Disease (LD) <https://www.cms.gov/Medicare/Provider-Enrollment-and-Certification/SurveyCertificationGenInfo/Downloads/Survey-and-Cert-Letter-17-30.pdf>

Updated Guidelines for the Control of Legionella in Western Pennsylvania  
[http://www.achd.net/infectd/pubs/pdf/2014\\_FINAL\\_Legionella\\_Guidelines\\_for\\_Western\\_PA.pdf](http://www.achd.net/infectd/pubs/pdf/2014_FINAL_Legionella_Guidelines_for_Western_PA.pdf)



*Thank You!*

# Any questions



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