Results for 37 Cases

41% of *Legionella* cases were missed when following current IDSA-ATS recommendations for *Legionella* testing

Diagnostic Methods: UA Rules!

- Urine antigen (UA) tests confirmed 97% of U.S. resident cases reported during 2005–2009
- Less than 10% of cases confirmed by culture – mostly because culture was not ordered
- Should perform cultures for Legionella of appropriate respiratory specimen **and** urinary antigen test

MMWR 2011 Vol 60 (32)

CDC Says Order Culture and Urine Antigen!

What Clinicians Need to Know about

LEGIONNAIRES' DISEASE

Legionnaires' disease is a sometimes fatal form of pneumonia that is on the rise in the United States. Unfortunately, this disease is also underrecognized and underdiagnosed. Clinicians are in a unique position to make sure cases are detected, allowing rapid investigation by public health officials and prevention of additional cases.

Diagnosis and Testing

Clinical features of Legionnaires' disease include cough, fever, and radiographic pneumonia. Signs and symptoms for Legionnaires' disease are similar to pneumonia caused by other pathogens; the only way to tell if a pneumonia patient has Legionnaires' disease is by getting a specific diagnostic test. Indications that warrant testing include:

- Patients who have failed outpatient antibiotic therapy for community-acquired

Order both a culture of a lower respiratory specimen and a urinary antigen test when testing patients for *Legionella*.

https://www.cdc.gov/legionella/clinicians.html

Dangers of Dependency on Urine Antigen

- Urine antigen specific for *L. pneumophila*, serogroup 1 only
- If used to screen for healthcare-acquired LD, you'd better know what's in your water!
  - If Lp-6 in the water, diagnosis will be missed

Whose Case Is It?

Was it community or hospital-acquired?

MMWR 2011 Vol 60 (32)

Definitions

- Incubation period for Legionnaires' disease is typically 2-10 days, but can be longer
- **Definite Case**: a patient admitted at least 10 days prior to onset of illness.
- **Possible/probable Case**: admitted for a portion of the incubation period prior to onset, including patients discharged and re-admitted within the incubation period.

Problem

- The average length of stay for pneumonia in the U.S. is 5.4 days.*
- Very few cases will fulfill the definition for "Definite" healthcare-acquired Legionnaires' disease.

*According to the Healthcare Cost and Utilization Project Nationwide Inpatient Sample from the Agency for Healthcare Research and Quality

Solution

- Don't assume a "possible/probable" case is not healthcare-acquired
- Investigate and perform an environmental investigation to determine the source of infection

What Triggers Investigation?

CDC Guidance: Prompts Investigation

- One case of definite healthcare-acquired Legionnaires' disease
- Two possible/probable healthcare-acquired LD within 12 months (changed from within 6 months)
- Patients in protected environments (PE) or transplant program and those visited outpatient PE setting

MMWR March 26, 2004 / 53(RR03);1-36 Guidelines for Preventing Health-Care--Associated Pneumonia

It Gets Expensive When Health Departments Investigate

- Initial environmental testing (case patient exposure areas) plus assess building colonization status
- Water restrictions (bottled water, no showering, look back case review)
- Emergency disinfection – then was it successful?
- Sample for *Legionella* every 2 weeks for 3 months, then monthly for 3 more months
- If any *Legionella* detected (any species), sequence begins again
- Frequent communication
- Long-term disinfection measures?

Approaches to Prevention

Denial

Most wait to address the problem until after a case of Legionnaires' disease is diagnosed.

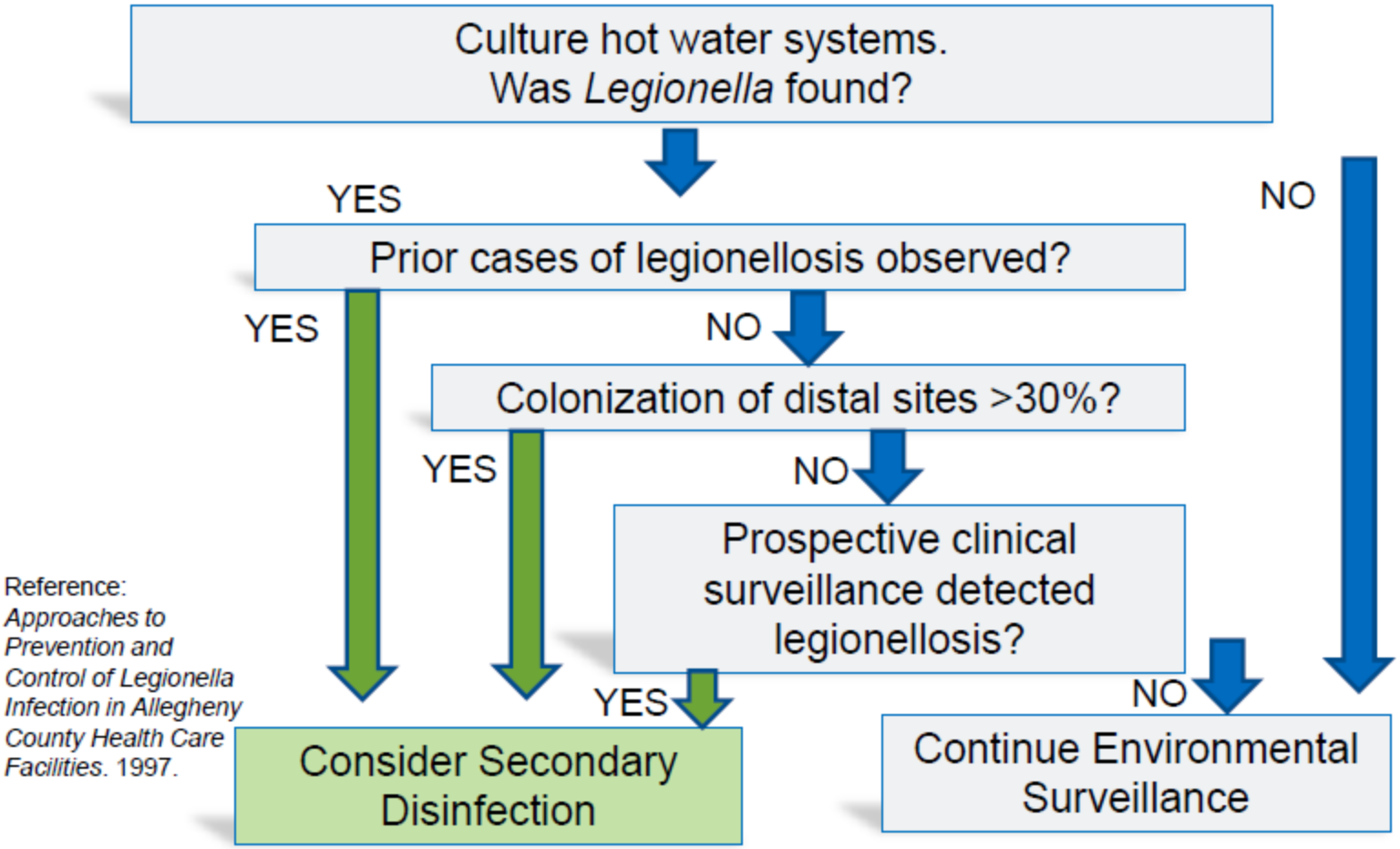
REACTIVE

- After cases identified
  - Case investigation and environmental testing/investigation
  - *Legionella* source identified = decontaminate

PROACTIVE

- Before cases occur, perform environmental testing
- *Legionella* source identified = decontaminate

Proactive Approach



Reference:
Approaches to Prevention and Control of Legionella Infection in Allegheny County Health Care Facilities. 1997.

Where Did The 30% Target Come From?

Proportion Not Concentration

Risk of Legionnaires' disease was better predicted by the **proportion** of water system sites testing positive for *Legionella* than by the concentration of *Legionella* bacteria.

Kool J L, et al. Infect. Control Hosp. Epid. 1999 20:797-805

Evidence-based Origins of 30% Distal Site Positivity As Risk Indicator

THE LANCET, AUGUST 6, 1983

LEGIONELLACEAE IN THE HOSPITAL WATER-SUPPLY

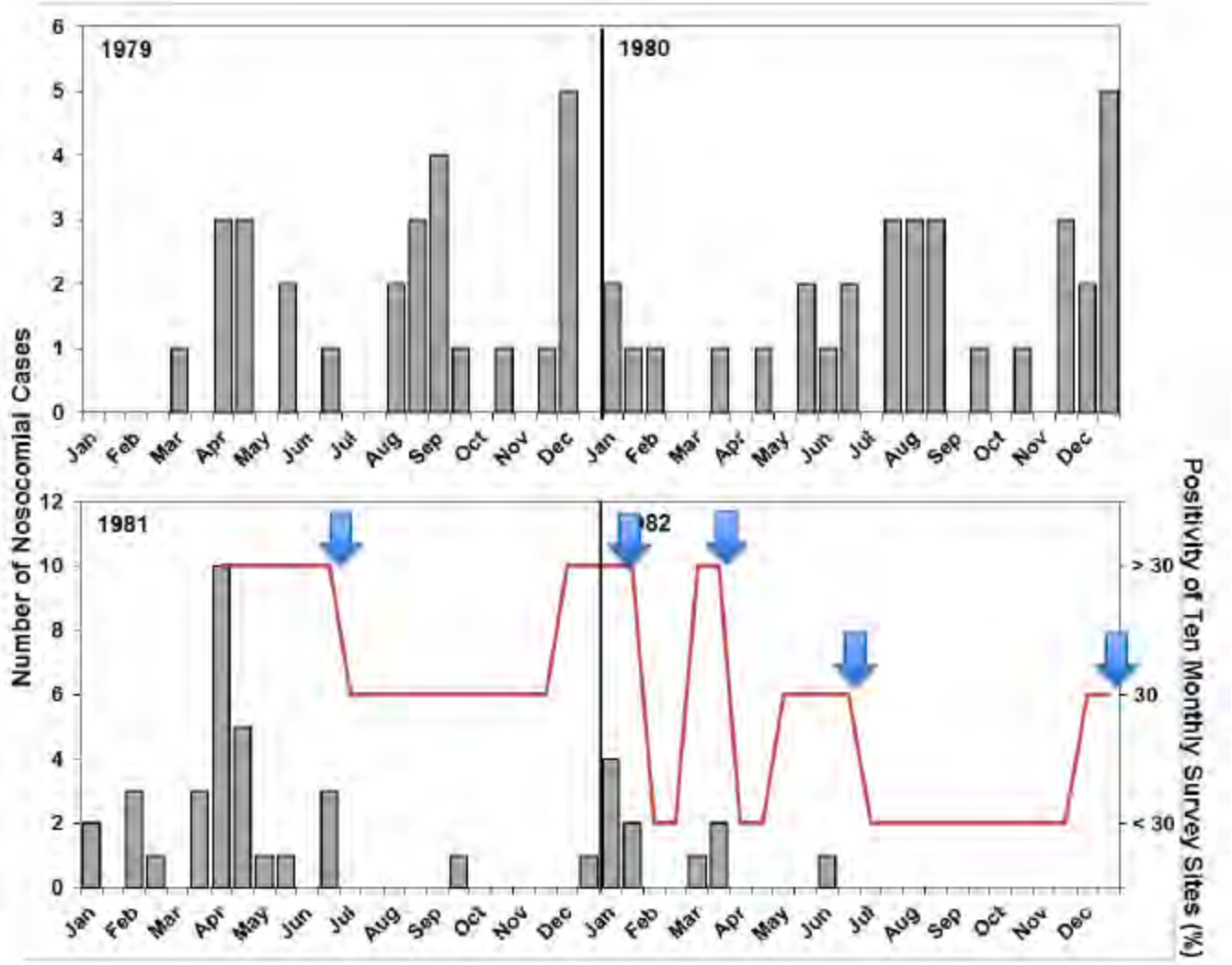
Epidemiological Link with Disease and Evaluation of a Method for Control of Nosocomial Legionnaires' Disease and Pittsburgh Pneumonia

MICHELE BEST, VICTOR L. YU, JANET STOUT, ANGELLA GOETZ, ROBERT R. MUDER, FLOYD TAYLOR

Infectious Disease and Special Pathogens Sections, Veterans Administration Medical Center; and University of Pittsburgh, Pittsburgh, Pennsylvania, USA

Correlation Between Disease and Distal Site Positivity

- Whenever monthly site positivity exceeded 30%, cases of Legionnaires' disease appeared in those months.
- Similarly, when positivity fell to 20% or less, no case of disease were observed.


1979
1980
1981
1982
Number of Nosocomial Cases
Positivity of Ten Monthly Survey Sites (%)
> 30
30
< 30
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

Validated in a Multi-Center Study

INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY JULY 2007, VOL. 28, NO. 7

ORIGINAL ARTICLE

Role of Environmental Surveillance in Determining the Risk of Hospital-Acquired Legionellosis: A National Surveillance Study With Clinical Correlations

Janet E. Stout, PhD; Robert R. Muder, MD; Sue Mietzner, MS; Marilyn M. Wagener, MS; Mary Beth Perri, BS; Kathleen DeRoos, MSN; Dona Goodrich, BS; William Arnold, MS; Theresa Williamson, MS; Ola Ruark, MSN; Christine Treadway, MSN; Elizabeth C. Eckstein, MSN; Debra Marshall, RN; Mary Ellen Rafferty, MS; Kathleen Sarro, RN; Joann Page, MS; Robert Jenkins, BA; Gina Oda, MS; Kathleen J. Shimoda, RN, BS; Marcus J. Zervos, MD; Marvin Bittner, MD; Sharon L. Camhi, MD; Anand P. Panwalker, MD; Curtis J. Donskey, MD; Minh-Hong Nguyen, MD; Mark Holodniy, MD; Victor L. Yu, MD; and the Legionella Study Group

Infect Control Hosp Epid 2007; 28 (7)

10 NYCRR Part 4 - Subpart 4-2, Health Care Facilities

- Requires that all covered healthcare facilities adopt and implement:
  - a sampling and management plan for their potable water systems by December 1, 2016, and
  - new covered facilities must adopt such plan prior to providing services.

New York Code, Rules and Regulations
NYCRR Title 10 Part 4: Protection Against Legionella

New York State Regulation Uses 30% Distal Site Positivity

Percentage of Positive *Legionella* test Sites	Response
<30%	Maintain environmental assessment and *Legionella* monitoring in accordance with the sampling and management plan
>30%	Institute short-term control measures and notify the department. • Re-sample no sooner than 7 days and no later than 4 weeks after disinfection • If retest is ≥ 30% positive, repeat short-term control measures. • If results < 30% positive, resume monitoring in accordance with the sampling and management plan.

Approach to Environmental Sampling

- Select a minimum of:
  - 10 distal outlets (faucets or showers) that roughly represent the water distribution system. Collect first draw hot water.
  - Hot water tanks
  - Hot water recirculation line

Estimating Risk and Evaluating Efficacy (Validating) of Water Management

- What proportion of outlets were positive for *Legionella* (test at least 10 faucets or showers)?

- If >30% risk increases, especially if *L. pneumophila*, serogroup 1 is present (now part of NY State regulation)

Greater Focus On Legionella Prevention

JUNE 2016

CDC Vitalsigns™

Legionnaires' Disease

Use water management programs in buildings to help prevent outbreaks

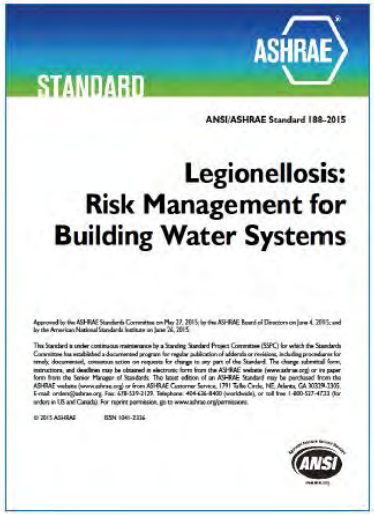
CDC investigated the first outbreak of Legionnaires' disease, a serious lung infection (pneumonia), in 1976. An increasing number of people in the US are getting this disease, which is caused by breathing in small water droplets contaminated with *Legionella* germs. About 5,000 people are diagnosed with Legionnaires' disease and there are at least 20 outbreaks reported each year. Most identified outbreaks are in buildings with large water systems, such as hotels, long-term care facilities, and hospitals. *Legionella* grows best in building water systems that are not well maintained. Building owners and

4x

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

CDC Focuses on Effective Water Management For Legionnaires' Disease Prevention (AKA ASHRAE 188)

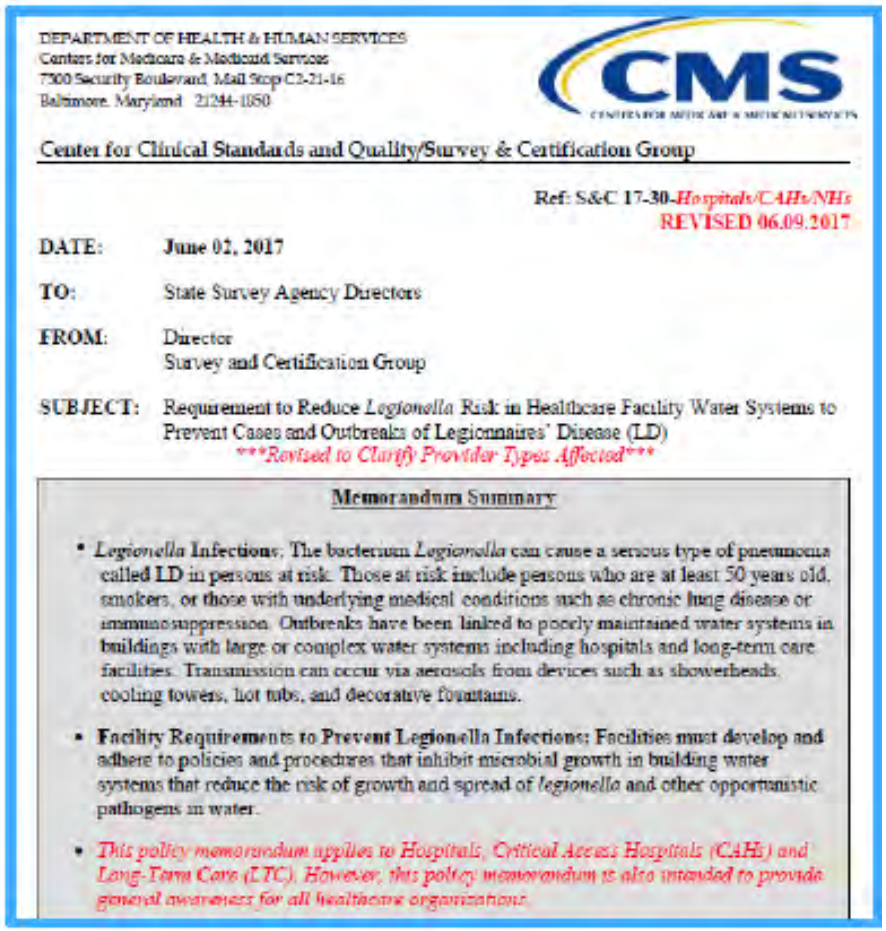
ASHRAE 188/CDC toolkit



CMS Refers to ASHRAE and CDC

CMS Survey and Certification *Legionella* Memo June 2017

- Implement plan that reduces *Legionella* and other opportunistic water pathogens



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

CMS
CENTERS FOR MEDICARE & MEDICAID SERVICES

Center for Clinical Standards and Quality/Survey & Certification Group

Ref: S&C 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.*

Requirements for Surveyors and Healthcare Facilities

- This policy memorandum applies to:
  - Hospitals, Critical Access Hospitals (CAHs) and Long-Term Care (LTC).
  - This policy memorandum is also intended to provide general awareness for all healthcare organizations.

CMS Expectations

- All covered facilities to have water management policies to reduce the risk of growth and spread of *Legionella* and other opportunistic pathogens in building water systems

CMS Expects….
Water Management

- Develops and implements a water management program that considers the ASHRAE industry standard and the CDC toolkit
- and includes control measures such as physical controls, temperature management, disinfectant level control, visual inspections, and environmental testing for pathogens.

CMS Expects…
Risk Assessment

- Conduct a risk assessment to identify where *Legionella* and other opportunistic waterborne pathogens could grow and spread in the water system

- Other Opportunistic Waterborne Pathogens (OPPs)
  - *Pseudomonas*, *Acinetobacter*, *Burkholderia*, *Stenotrophomonas*, nontuberculous mycobacteria, and fungi

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

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

DATE: **June 02, 2017**

TO: State Survey Agency Directors

FROM: Director
Quality, Safety and Oversight Group (*formerly Survey & Certification Group*)

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

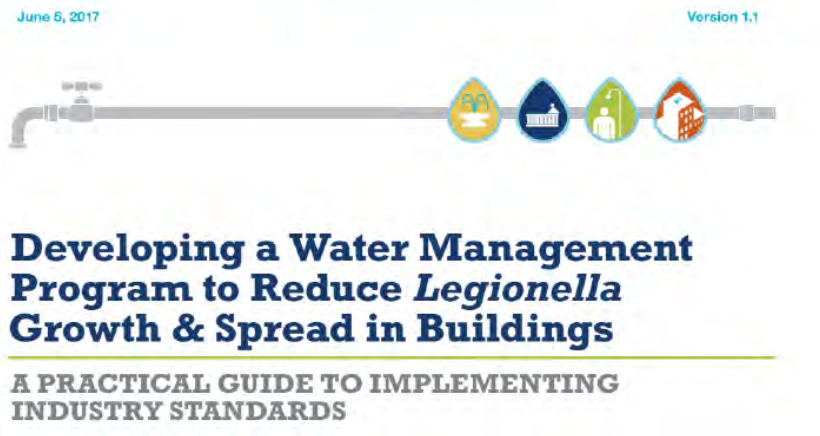
****Revised to Clarify Expectations for Providers, Accrediting Organizations, and Surveyors****

CMS MEMORANDUM
REVISED JULY 2018

CMS Eliminates Requirement For *Legionella* Testing

- Note: CMS does not require water cultures for *Legionella* or other opportunistic waterborne pathogens. Testing protocols are at the discretion of the provider.
- What happened between June 2017 and July 2018?
  - CMS was lobbied to remove this provision.

CDC Toolkit Emphasizes Water Management



CDC Tool Kit 2017

Environmental testing for *Legionella* is useful to validate the effectiveness of control measures.

CDC Toolkit on Testing

- Factors that might make testing for Legionella more important include:
  - Having difficulty maintaining the building water systems within control limits
  - Having a prior history of Legionnaires' disease associated with the building water systems
  - Being a healthcare facility that provides inpatient services to people who are at increased risk for Legionnaires' disease

Detecting Legionella

BUILDING WATER SYSTEMS

Why Is Detecting *Legionella* Important?

If you don't look for it, you won't find it.

If you don't find it, you don't think you have a problem.

If you don't think you have a problem, you don't do anything about it.

–Bruce Dixon, M.D.
Director, Pittsburgh ACHD

Assessing Risk

Myth – Legionella is not everywhere (ubiquitous)

- Healthcare facilities – greater risk
  - Is your facility in the 50% of buildings with or without *Legionella*?
- Only 30-50% of cooling towers positive for *Legionella*

Why Test for *Legionella*?

- Assess the risk
- Control the risk (through engineering controls or water treatment)
- Before cases occur

Preventing Legionnaires' Disease Through *Legionella* Control

Zero Cases Is The Goal,

Not

Zero Legionella

Don't Chase Zero

Zero *Legionella* is virtually impossible to achieve in complex water systems

Preventing Legionnaires' Disease

Controlling Legionella is about preventing disease, not about reaching zero Legionella in water.

The *Legionella* Family Has Over 60 members (species)

adelaidensis
anisa
beliardensis
birminghamensis
bozemanae
brunensis
busanensis
cardiaca
cherrii
cincinnatiensis
clemsonensis
donaldsonii
drancourtii
dresdenensis
drozanskii
dumoffii
erythra
fairfieldensis
fallonii
feeleii
geestiana
genomospecies 1
gormanii
gratiana
gresilensis
hackeliae
impletisoli
israelensis
jamestowniensis
jeonii
jordanis
lansingensis
londiniensis
longbeachae
lytica
maceachernii
massiliensis
micdadei
monrovica
moravica
nagasakiensis
nautarum
norrlandica
oakridgensis
parisiensis
pittsburghensis
Legionella pneumophila: serogroup 1
serogroups 2-16
quateirensis
quinlivanii
rowbothamii
rubrilucens
sainthelensi
santicrucis
shakespearei
spiritensis
steelei
steigerwaltii
saoudiensis
taurinensis
thermalis
tucsonensis
tunisiensis
wadsworthii
waltersii
worsleiensis
yabuuchiae

Not All Legionella Are Pathogenic

- If you find *Legionella* – what type did you find?
- There are over 60 species and serogroups
  - Not all *Legionella* have the same risk
  - *L. pneumophila* serogroup 1 has highest risk for disease
  - Many species common in water, but rarely cause infection (much less risk)

Legionella Species That Fluoresce Under UV Light

- Some fluoresce red and some fluoresce blue-white
- Blue-white species
  - *L. anisa*
  - *L. dumoffii*
  - *L. gormanii*
  - *L. bozemanii*

Legionella rubrilucens

Report on NYC Bronx Outbreak

Legionnaires' Disease Outbreak Caused by Endemic Strain of *Legionella pneumophila*, New York, New York, USA, 2015

Pascal Lapierre, Elizabeth Nazarian, Yan Zhu, Danielle Wroblewski, Amy Saylors, Teresa Passaretti, Scott Hughes, Anthony Tran, Ying Lin, John Kornblum, Shatavia S. Morrison, Jeffrey W. Mercante, Robert Fitzhenry, Don Weiss, Brian H. Raphael, Jay K. Varma, Howard A. Zucker, Jennifer L. Rakeman, Kimberlee A. Musser

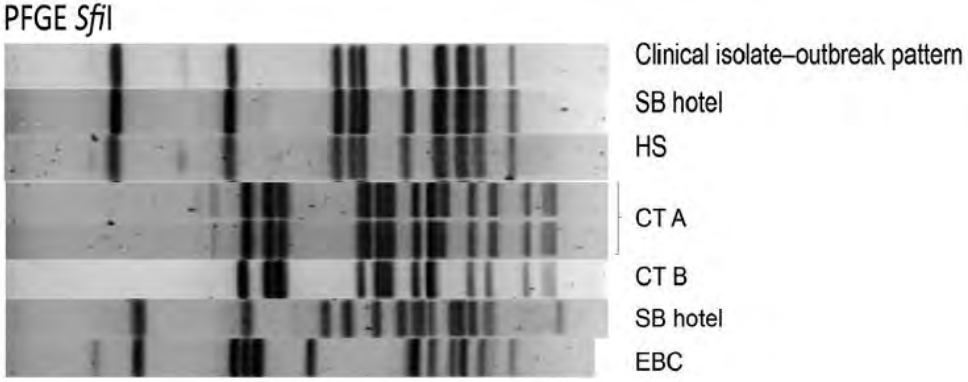
Emerging Infectious Diseases • www.cdc.gov/eid • Vol. 23, No. 11, November 2017

How Was The Outbreak Linked to Hotel Cooling Tower?

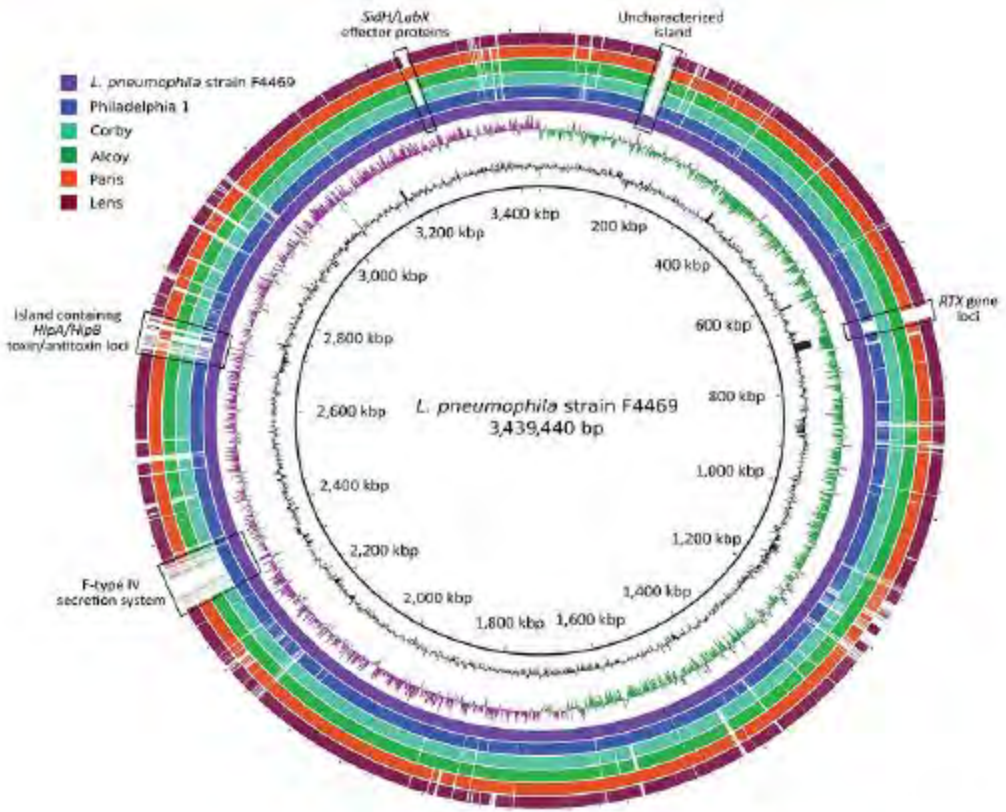
NYC Outbreak in July 2015

- **Many possible sources of exposure:**
  - *Legionella pneumophila*, serogroup 1 was recovered from 52/183 cooling towers.
- All alike at the species/serogroup level.
- The source was identified by looking at differences at the genetic level

Pulsed-Field Gel Electrophoresis (PFGE)



Whole-Genome Sequencing



From Lapierre et al. Emerging Infectious Diseases; Vol. 23, No. 11, November 2017