SPECIAL PATHOGENS LABORATORY®
THE LEGIONELLA EXPERTS®

ENDING LEGIONNAIRES' DISEASE: AN AUDACIOUS AND ACHIEVABLE GOAL

Janet E. Stout, PhD
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Research Associate Professor, University of Pittsburgh

This course is registered with AIA CES for continuing professional education.

AIA Buffalo/WNY Chapter

A001

Ending Legionnaires' Disease: Audacious and Achievable Goal

BUF2016-

Janet E. Stout, PhD

Date: October 15, 2018

Credit(s) earned on completion of this course will be reported to AIA CES for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon request.

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

Course Description

CMS has mandated *Legionella* risk assessments and water safety plans for healthcare and LTC facilities referring facilities to ASHRAE Standard 188 and the CDC Toolkit. Successful implementation will require specific knowledge about the risk of *Legionella* in the built environment, *Legionella* guidelines and standards, the role of testing in disease prevention, approaches to prevention, secondary disinfection and other waterborne pathogens of concern. Learn what can happen when a confirmed case of healthcare-acquired Legionnaires' disease is diagnosed and key elements to developing an effective water management plan. You will be better prepared for when a CMS surveyor asks for your *Legionella* risk assessment and water management plan.

Learning Objectives

At the end of the this course, participants will be able to:

1. Understand *Legionella* as a waterborne pathogen, and cause of healthcare-acquired pneumonia

2. Understand the role of environmental testing for *Legionella* in evaluating risk

3. Implementing approaches to prevention

Copyright Materials

SPECIAL PATHOGENS LABORATORY®

THE LEGIONELLA EXPERTS®

CONTINUING EDUCATION AIA

My Affiliations – Two Hats

- Research Associate Professor in the Dept. of Civil & Environmental Engineering at the University of Pittsburgh
- President of Special Pathogens Laboratory, a laboratory and consulting firm specializing in *Legionella* detection and control

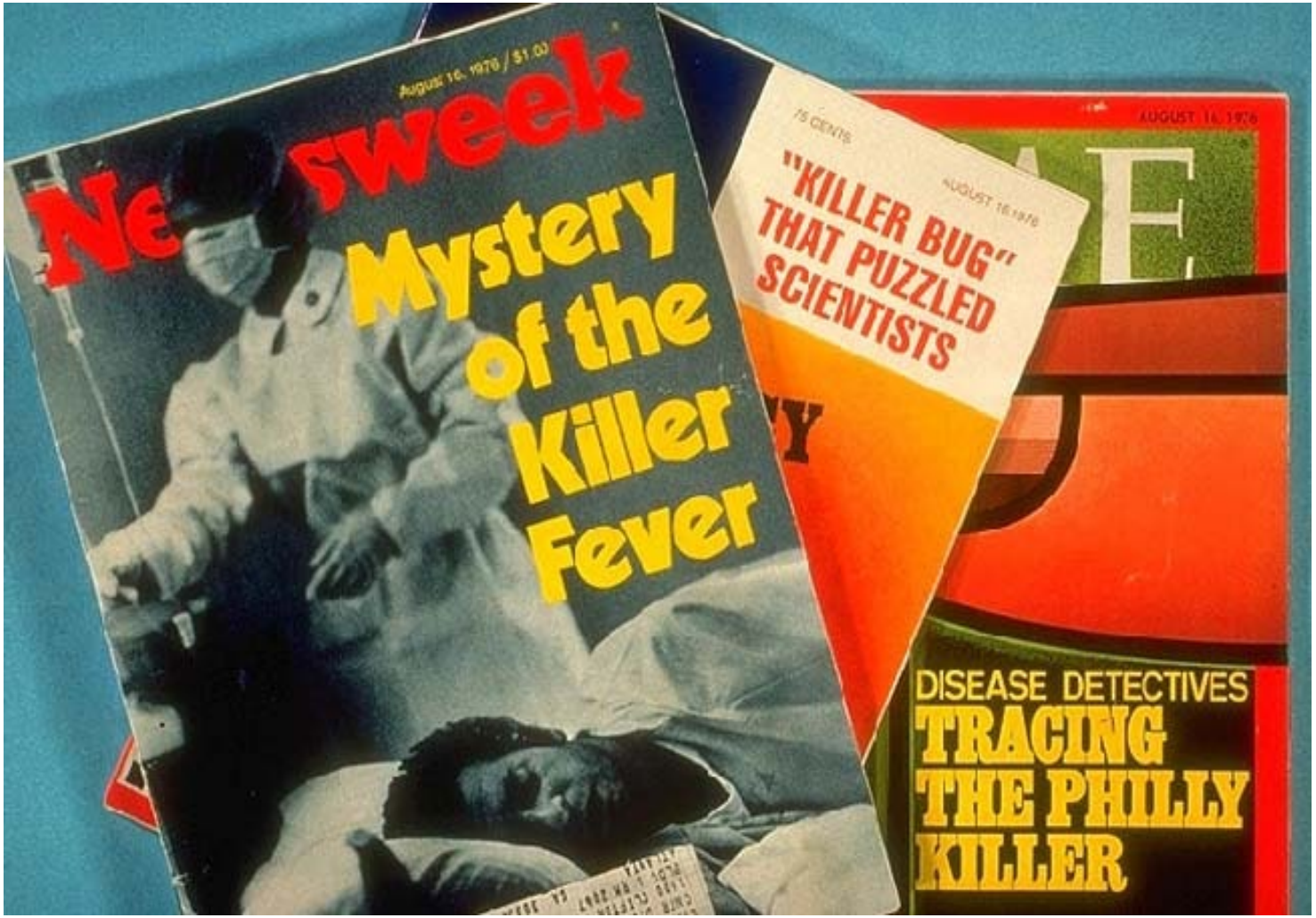
SPL's Mission: End Legionnaires' Disease

- No one should die from a preventable disease caused by a bacteria in water.
- Legionnaires' disease can and should be prevented.

Today's Topics

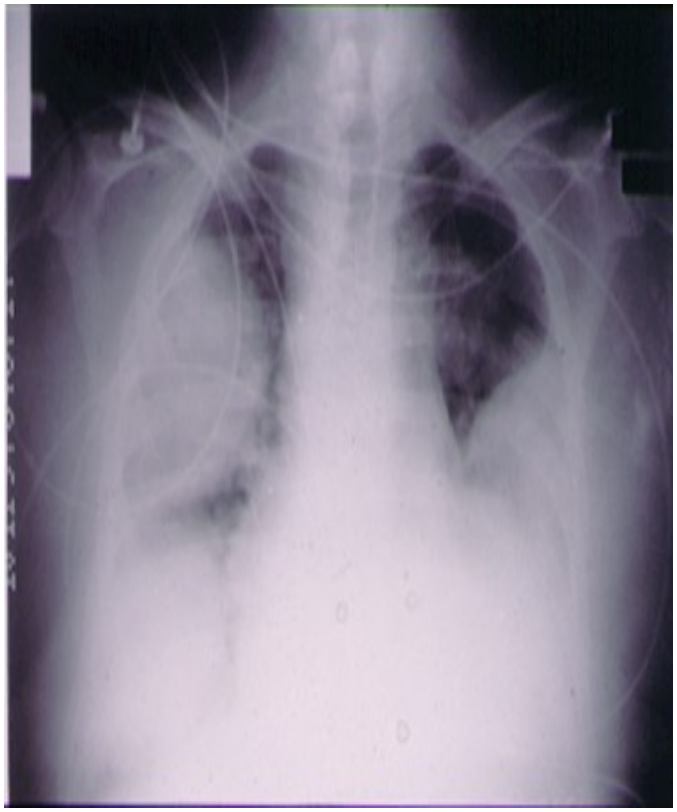
- Our evolving understanding of *Legionella pneumophila* as a waterborne pathogen
- Evaluating risk and the role of environmental testing for *Legionella*
- Approaches to prevention – Ending Legionnaires' disease

Celebrating More Than 40 Years of Making Headlines



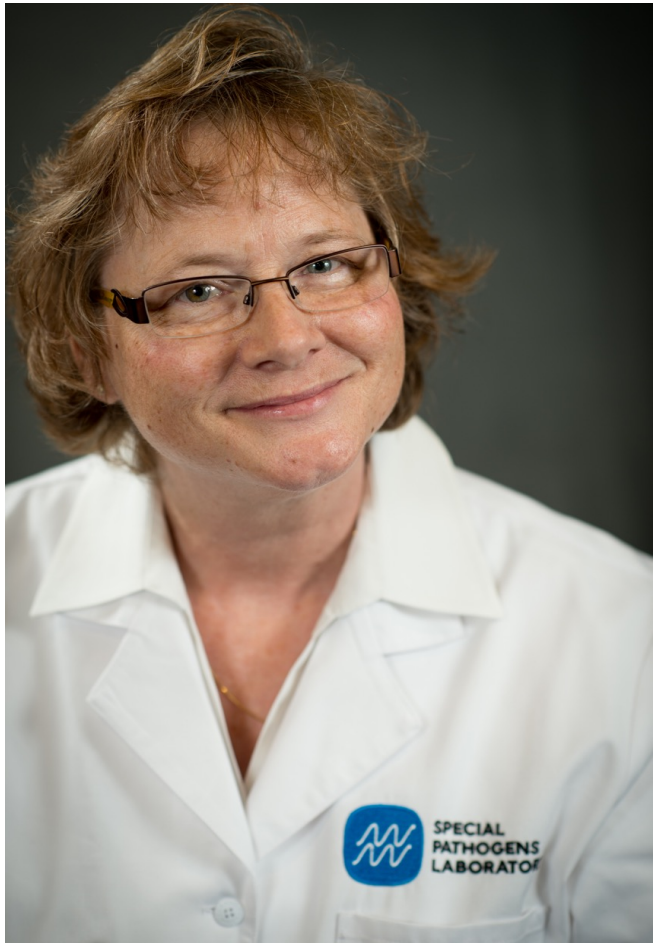
American Legion Convention at the Bellevue-Stratford Hotel

1976 Philadelphia



- 58th convention of the American Legion held July 21-24
- Mysterious illness effects 221 and kills 34
- Causative agent of pneumonia would not be identified until 1977

1980: Research Begins in Pittsburgh



- More than 30 years studying Legionnaires' disease
  - I'm a Legionellologist
- Mission: What I've learned can help you address Legionella risk

Since 1980: Research Pioneers

Janet E. Stout and Victor L. Yu

- Over 100 nosocomial cases identified in 5 years in one hospital
- The source of the outbreak was the hospital water system – not a cooling tower!

The New England Journal of Medicine

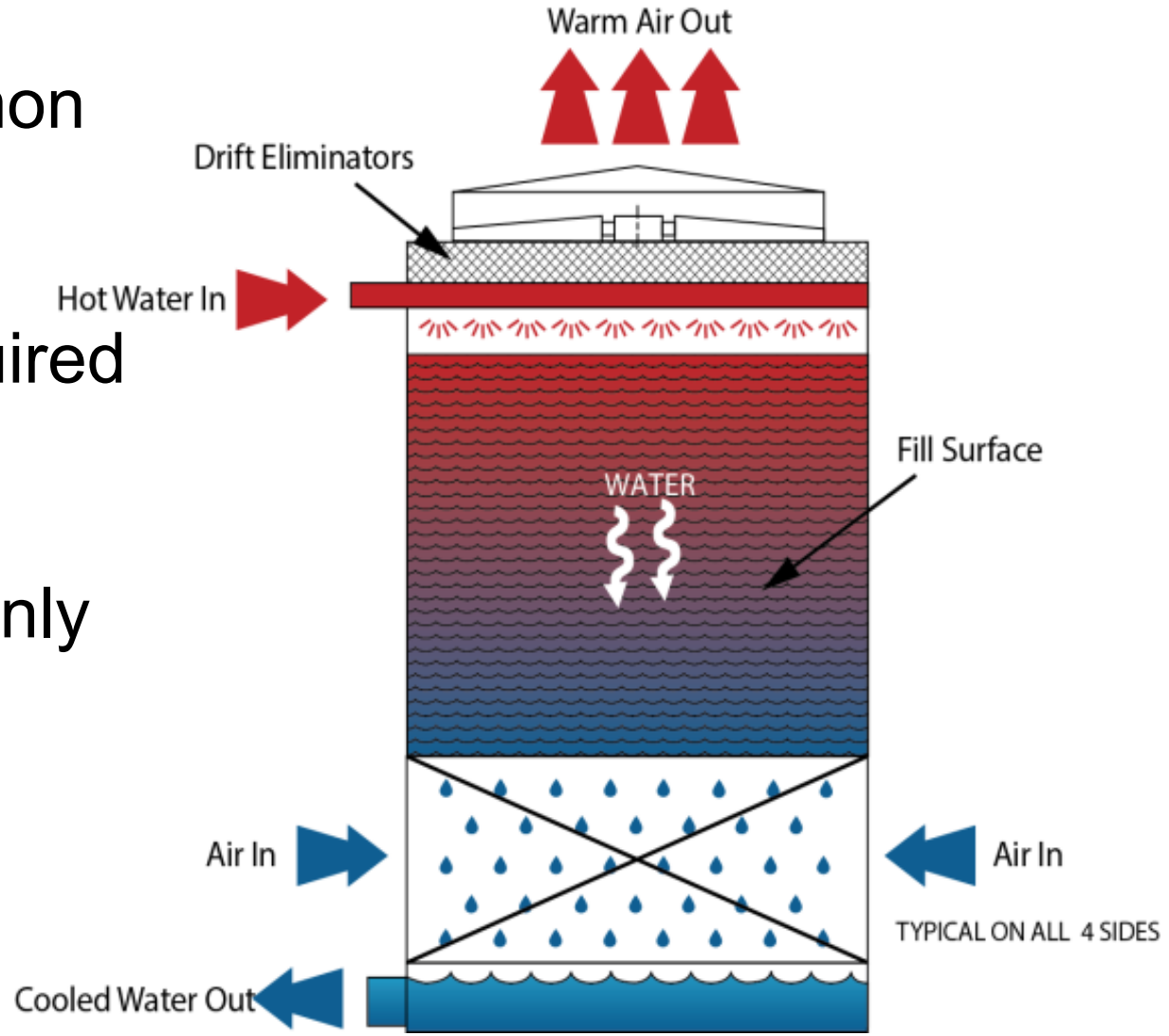
Established in 1812 as The NEW ENGLAND JOURNAL OF MEDICINE AND SURGERY

UBIQUITOUSNESS OF *LEGIONELLA PNEUMOPHILA* IN THE WATER SUPPLY OF A HOSPITAL WITH ENDEMIC LEGIONNAIRES' DISEASE

JANET STOUT, M.S.,
VICTOR L. YU, M.D.,
R. M. VICKERS, B.S.,
JEFFREY ZURAVLEFF, M.S.,
MICHELE BEST, B.A.,
ARNOLD BROWN, M.D.,
ROBERT B. YEE, PH.D.,
AND ROBERT WADOWSKY, M.S.

Paradigm Shift: Not Cooling Towers

- NOT a common source for sporadic and hospital-acquired cases
- More commonly associated with large community outbreaks



What We Know Now

Potable water especially in hospitals
(and other buildings)
with complex hot water systems,
is the most important source of
Legionella transmission.

PREVENTING LEGIONNAIRES' DISEASE

How Are We Doing?

Centers for Medicare and Medicaid Services (CMS)

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-ALL

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)

Legionellosis in the U.S.

Outbreaks continue to occur (building warm water systems, cooling towers, fountains)

Outbreaks in Nursing Homes & Assisted Living Facilities

OUTBREAKS

Legionnaires' death toll rises to 10 in western Illinois

Published September 09, 2015 · 20 98

QUINCY, Ill. – At least 10 people in western Illinois have now died from Legionnaires' disease, after a state veterans home reported two new fatalities among its residents.

An outbreak first identified in late August after an initial case was detected several weeks earlier has sickened 53 residents at the Quincy home, nine of whom died. Four others in Quincy have been diagnosed with the illness, one of whom died. Officials say those cases aren't connected to the larger outbreak.

Retirement Community

Second case of Legionnaire's disease reported at Ellicott City retirement community

Hotel Outbreaks

Legionellosis Outbreak at the Aria Hotel, 2009-2011
--Las Vegas, Nevada

Public Health Investigation Final Report

Hospital Outbreak

- New $135M 12-story patient tower
- Media coverage and legal action
- $61k for outbreak management

Dayton Daily News

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HOME > NEWS > LOCAL

Updated: 11:24 p.m. Thursday, July 21, 2011 | Posted: 11:23 p.m. Thursday, July 21, 2011

Legionnaires' outbreak linked to water

The hot water system sickened 11 patients at Miami Valley Hospital.

By Ben Sutherly

Staff Writer

DAYTON — Insufficient heating of the hot-water system in Miami Valley Hospital's new 12-story addition was the primary reason for the largest outbreak of Legionnaires' disease in Ohio since 2004, according to the hospital.

The outbreak of Legionnaires' disease at the hospital in February and March highlights an unintended result of plumbing codes that could put vulnerable populations like hospital patients at risk.

South Bronx Outbreak 2015

- 138 cases,16 deaths
- 26 were culture-confirmed with *Legionella pneumophila,* serogroup 1 isolated.

Legionnaires' disease outbreak in the South Bronx officially over: NYC health commissioner

Susan Watts/New York Daily News

"I'm happy to announce that the outbreak is over," Health Commissioner Mary Bassett told a Manhattan news conference.

The South Bronx outbreak of Legionnaires' disease that killed a dozen New Yorkers and sickened another 127 is officially history.

Outbreak Linked to Hotel Cooling Tower

Legionnaires' Disease Is International

Warstein, Germany

- 165 cases, 12 ICU, 2 deaths caused by *Legionella pneumophila*, serogroup 1

- Outbreak strain found in 2 cooling towers + other sources – including wastewater from a brewery!

- Public health communication

Public Safety Announcement

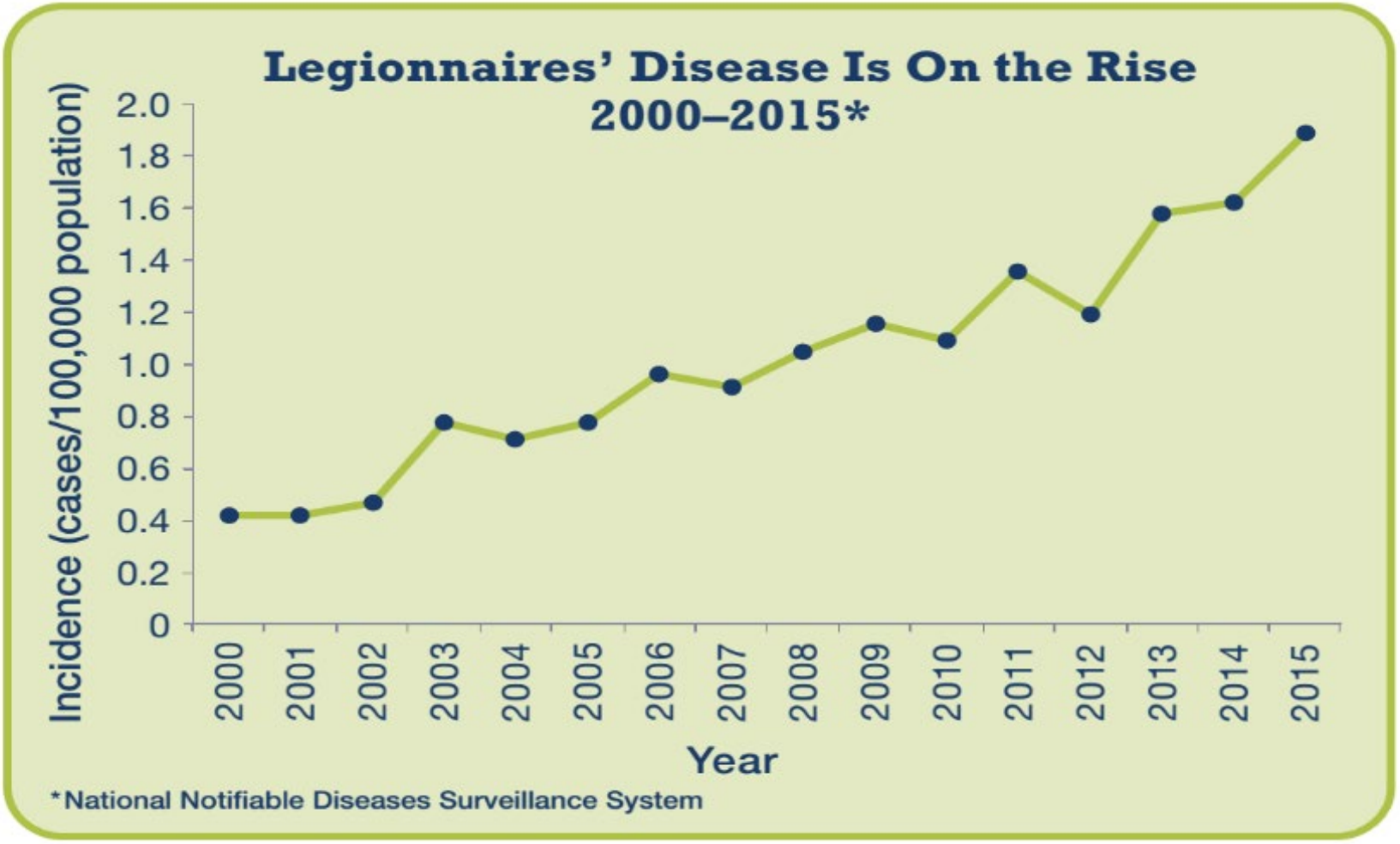
"Whether or not the Warsteiner brewery is found to be the breeding ground for the *Legionella* bacteria, officials have been making it clear that …

the beer is completely safe to drink."

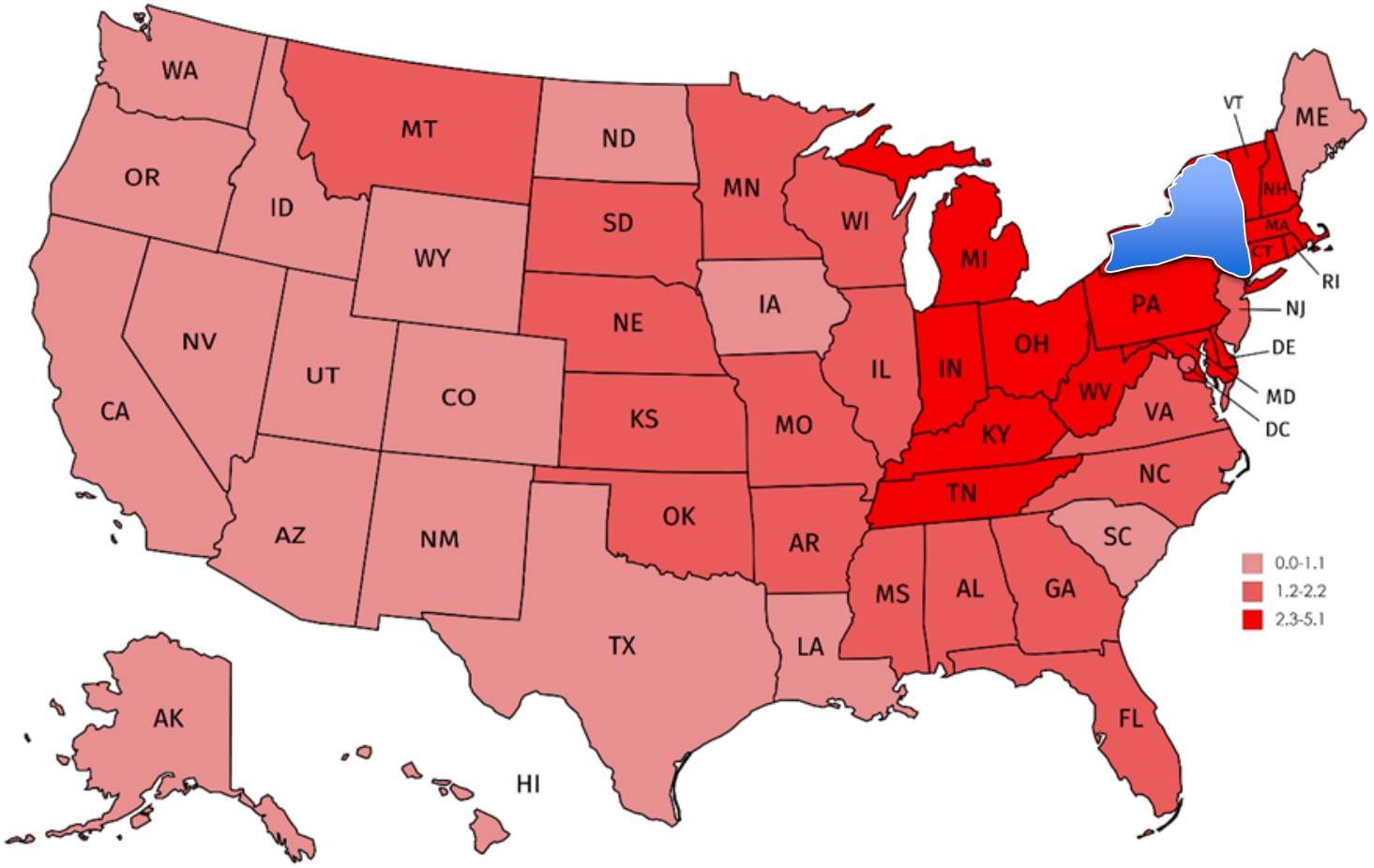
Consider This…

Legionellosis cases have increased substantially – over 300% in last 10 years

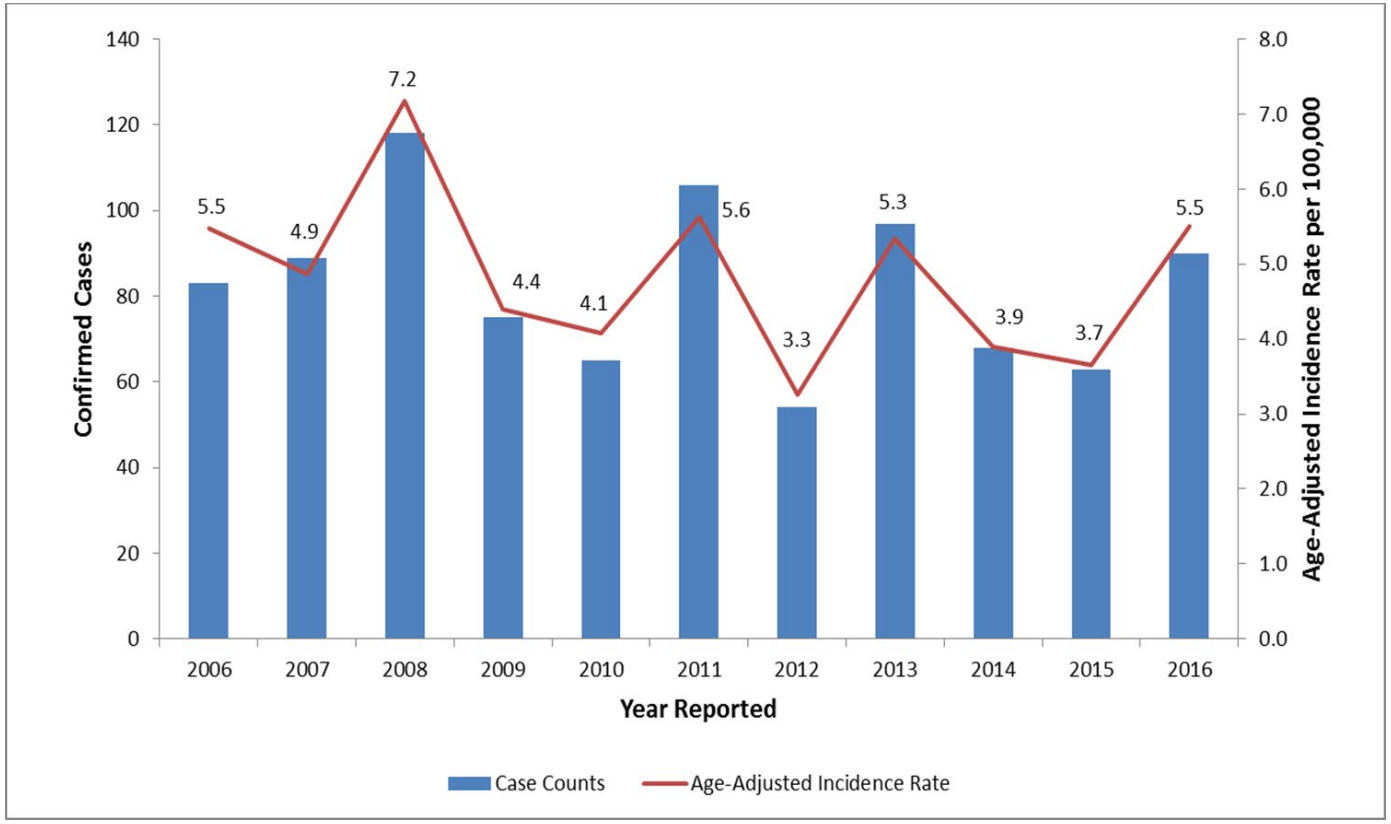
Disease Incidence Increasing



Mid-Atlantic Highest Rate (2.3-5.1 cases/100,000)



Allegheny County (Pittsburgh) Incidence of Legionnaires' Disease



Ohio

- Second in the United States for number of cases
- Second in the United States when calculated as a rate (# of cases per 100,000 population).
- **New York is first!**

Rebecca Fugitt, Ohio DOH

Who's at Risk?

- Elderly (>50)
- Smokers
- Immunocompromised
  - Transplant patients
  - High-dose steroids for lung disease
  - Diabetes
  - Cancer
- Approx. 25% cases no known risk factors

Modes of Transmission for Legionnaires' disease

- Aerosolization
- Aspiration
- Direct instillation into the patient (tap water rinsing of nasogastric tubes, respiratory tubing, etc)

Transmission by CPAP?

Sleep Medicine 14 (2013) 1038

Contents lists available at ScienceDirect

Sleep Medicine

journal homepage: www.elsevier.com/locate/sleep

Letter to the Editor

Two cases of Legionnaires' disease associated with continuous positive airway pressure therapy

To the Editor

Sporadic cases and outbreaks of *Legionella pneumophila* usually are related to exposure to water-containing *Legionella* bacterium. Legionnaires' disease is transmitted by contaminated water in medical equipment, including oxygen humidifiers, nebulizers, and face masks, and has been extensively reported [1,2]. Nevertheless, demonstrated a positive urine *Legionella* antigen test. He was administered levofloxacin to which he responded well; he was extubated 3 days after initiation of treatment.

To prevent dryness of patient airway, the CPAP machine circuit needs to be continuously humidified, which requires a water reservoir. This reservoir might serve as a media for *Legionella* bacterium, thus posing the risk for *L pneumophila* infection to the patients. Physicians should be aware of this potential association especially when taking care of patients who use this machine, as seen in our two patients.

Clinical Notes

- Elderly – signs not typical
- 40%–50% of Legionnaires' disease patients have neurological symptoms
  - Some with encephalopathy (brain inflammation) triggered by antibodies that target brain cells (www.legionella.org)

Clinical Notes

- Risk of death highest for community-acquired infection in patients that are immunocompromised followed by healthcare-acquired infections

- Mortality for healthcare-acquired cases as high as 30%

2016 CDC Report on Legionnaires' Disease Outbreaks

Morbidity and Mortality Weekly Report

Vital Signs: Deficiencies in Environmental Control Identified in Outbreaks of Legionnaires' Disease — North America, 2000–2014

Laurel E. Garrison, MPH[1]; Jasen M. Kunz, MPH[2]; Laura A. Cooley, MD[1]; Matthew R. Moore, MD[1]; Claressa Lucas, PhD[1]; Stephanie Schrag, DPhil[1]; John Sarisky, MPH[2]; Cynthia G. Whitney, MD[1]

On June 7, 2016, this report was posted as an MMWR *Early Release on the* MMWR *website (http://www.cdc.gov/mmwr).*

Outbreak Sources: More Than Healthcare

- 27 Outbreaks - Sources
  - 44% Hotels and resorts
  - 19% Long-term care facilities
  - 15% Hospitals
  - 21% Senior living facilities,
    - workplaces, and the community

Hospitals at Significant Risk According to Recent CDC Report

Legionella in hospitals – accounted for 57% of all cases and 85% of deaths

Potable Water vs. Utility (Cooling Towers)

- Potable water was the most frequent source of exposure (56%), followed by cooling towers (22%)
- Potable water sources accounted for 67% of health care–associated outbreaks (in hospitals and long-term care facilities).

HEALTHCARE-ACQUIRED CASES

Epidemiology and Infection Prevention

Hospital-acquired Legionnaires' Disease

Centers for Disease Control and Prevention
MMWR
Morbidity and Mortality Weekly Report
Early Release / Vol. 66
June 6, 2017

Vital Signs: Health Care–Associated Legionnaires' Disease Surveillance Data from 20 States and a Large Metropolitan Area — United States, 2015

Findings

- 20% of the reported cases healthcare-acquired
- Majority (80%) of definite cases associated with long-term care
- Problem is nationwide with cases reported from 20/21 jurisdictions

According to CDC Acting Director Anne Schuchat, MD

"Legionnaires' disease in hospitals is widespread, deadly, and preventable."

"These data are especially important for health care facility leaders, doctors, and facility managers because it reminds them to think about the risks of *Legionella* in their facility **and to take action…"**

Legionellosis in the U.S.

Outbreaks continue to occur (building warm water systems, cooling towers, fountains)

Cases Linked to Water Systems

- Warm water distribution in:
  - Hospitals
  - Nursing homes
  - Rehabilitation centers
  - Office buildings
  - Apartment buildings
  - Hotels
- Other water systems:
  - Spas and hot tubs
  - Decorative fountains
  - Humidifiers
  - Cooling towers

Today The D's Are For…

- Diagnosis
- Denial
- Detection (Environmental)
- Disinfection

Diagnosis: Many Cases Missed

- Diagnostic tests for *Legionella* not routine – often not done

- Many studies have demonstrated under reporting/missed diagnosis

Under Reporting Due to Missed Diagnosis

Hollenbeck *et al. BMC Infectious Diseases* 2011, **11**:237
http://www.biomedcentral.com/1471-2334/11/237

BMC
Infectious Diseases

RESEARCH ARTICLE Open Access

How often is a work-up for *Legionella* pursued in patients with pneumonia? A retrospective study

Brian Hollenbeck[1], Irene Dupont[2] and Leonard A Mermel[2,3*]

Abstract

Background: It is unclear how often patients with pneumonia are assessed for *Legionella* in endemic areas. Additionally, the sensitivity of the IDSA/ATS criteria for recommended *Legionella* testing is undefined.

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

MMWR 2011 Vol 60 (32)

Whose Case Is It?

Was it community or hospital-acquired?

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?

Denial

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

Approaches to Prevention

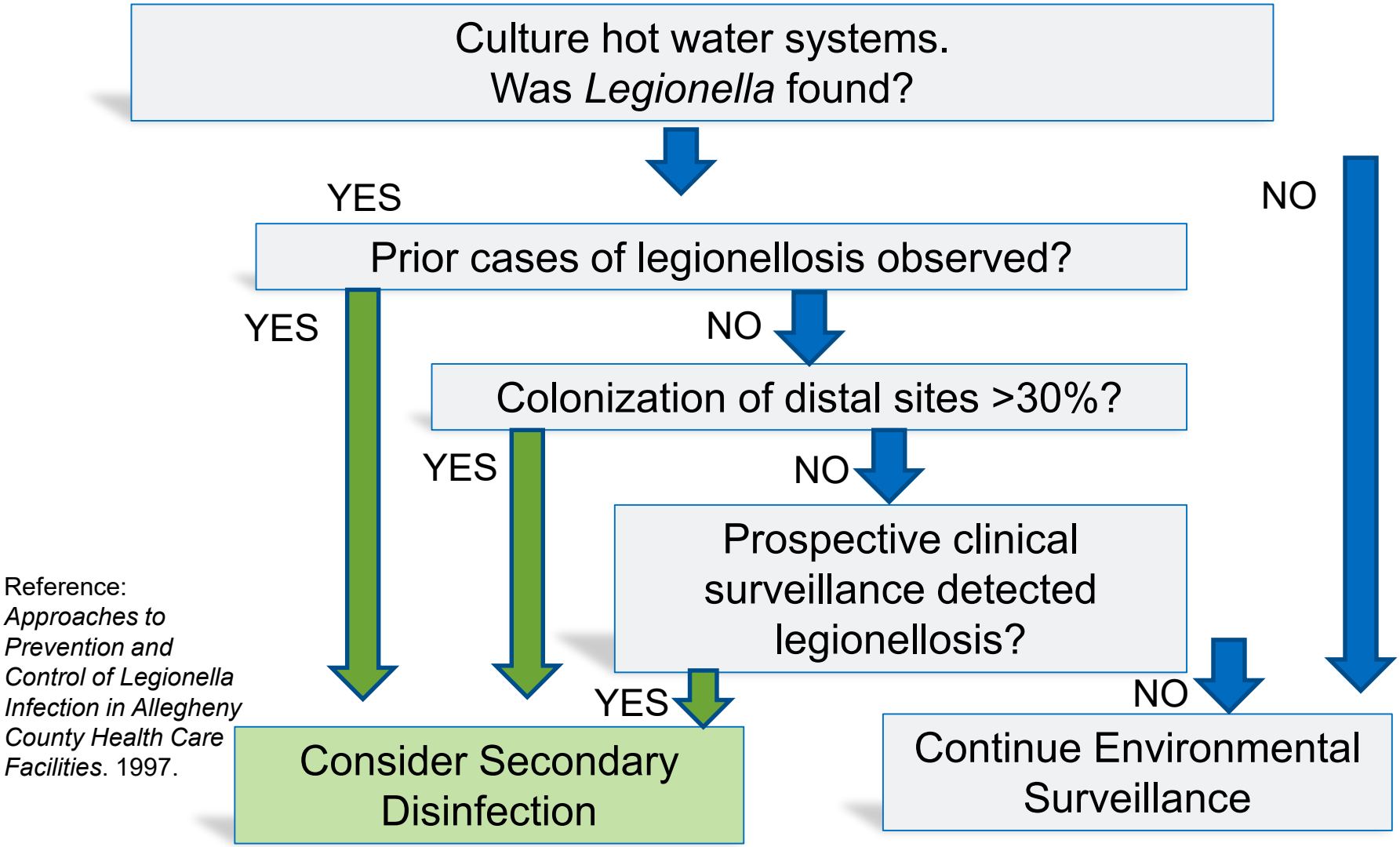
REACTIVE

- 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

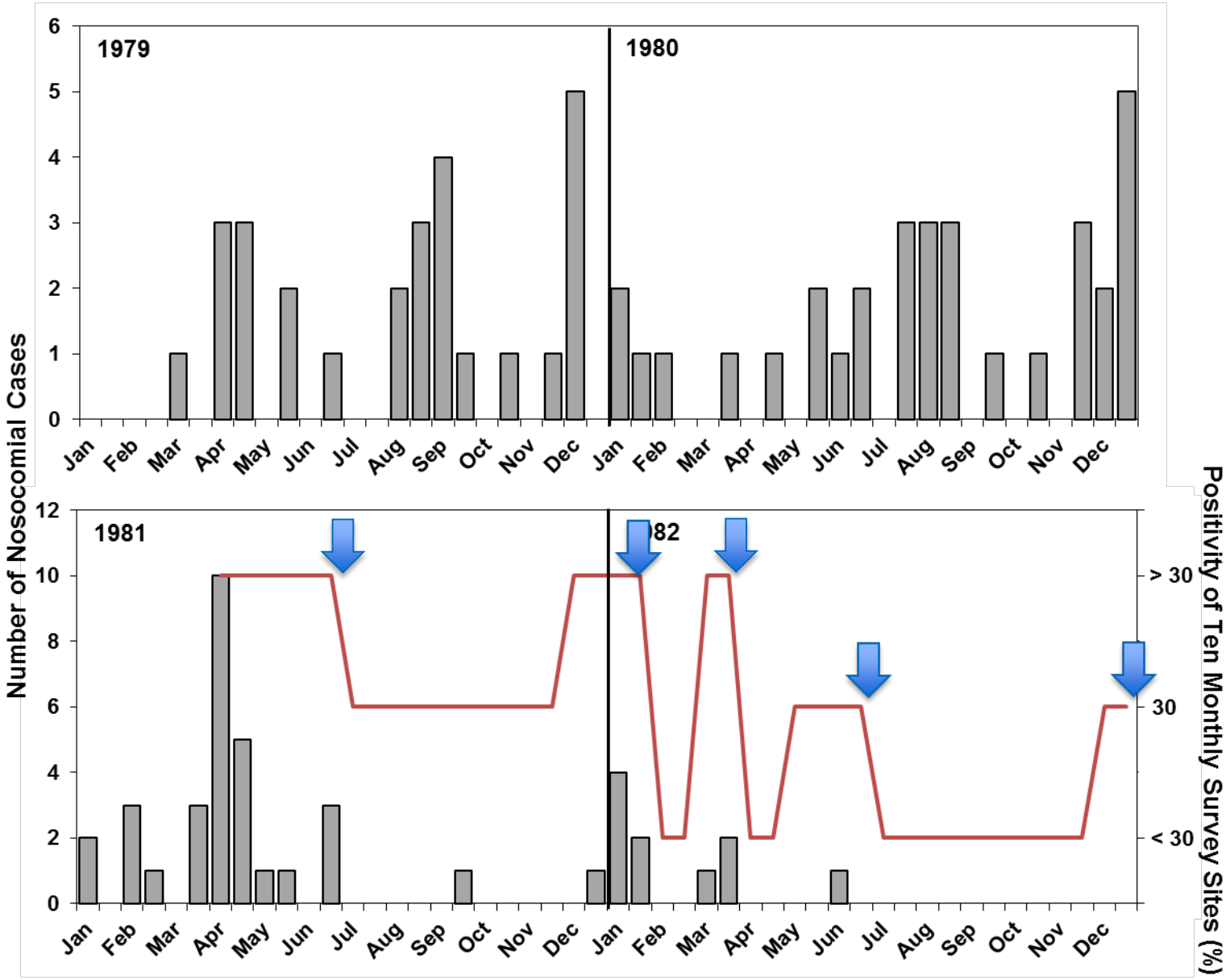
Epidemiological Link with Disease and Evaluation of a Method for Control of Nosocomial Legionnaires' Disease and Pittsburgh Pneumonia

MICHELE BEST
JANET STOUT
ROBERT R. MUDER
VICTOR L. YU
ANGELLA GOETZ
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
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™

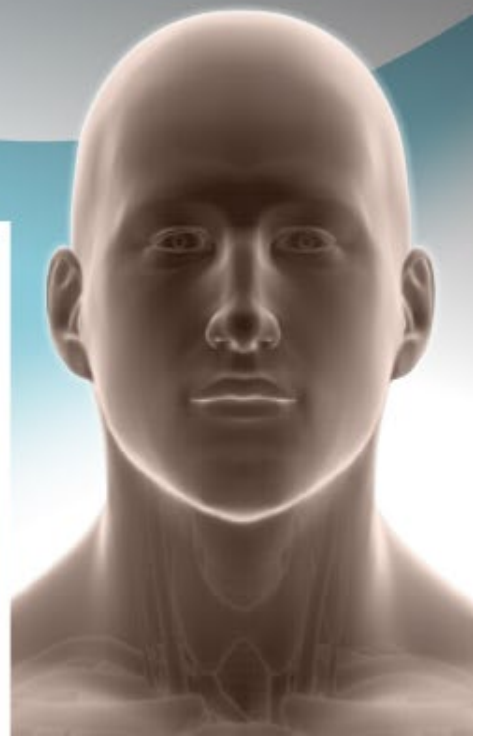
Legionnaires' Disease

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

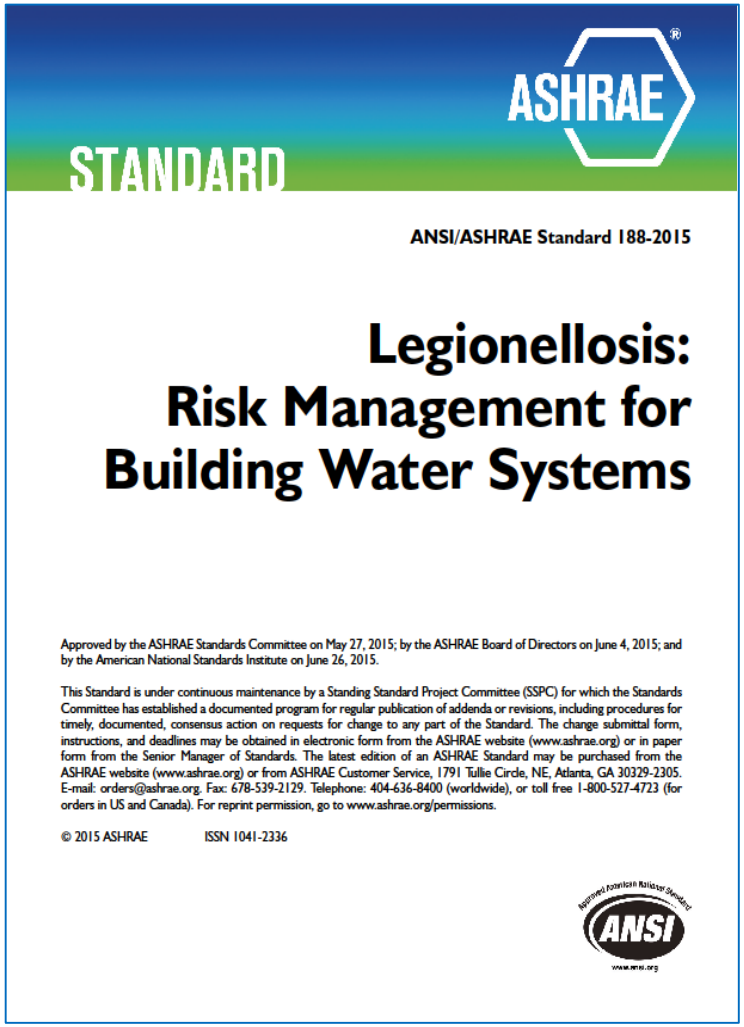
4x

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



STANDARD

ASHRAE

ANSI/ASHRAE Standard 188-2015

Legionellosis: Risk Management for Building Water Systems

Approved by the ASHRAE Standards Committee on May 27, 2015; by the ASHRAE Board of Directors on June 4, 2015; and by the American National Standards Institute on June 26, 2015.

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. The change submittal form, instructions, and deadlines may be obtained in electronic form from the ASHRAE website (www.ashrae.org) or in paper form from the Senior Manager of Standards. The latest edition of an ASHRAE Standard may be purchased from the ASHRAE website (www.ashrae.org) or from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: orders@ashrae.org. Fax: 678-539-2129. Telephone: 404-636-8400 (worldwide), or toll free 1-800-527-4723 (for orders in US and Canada). For reprint permission, go to www.ashrae.org/permissions.

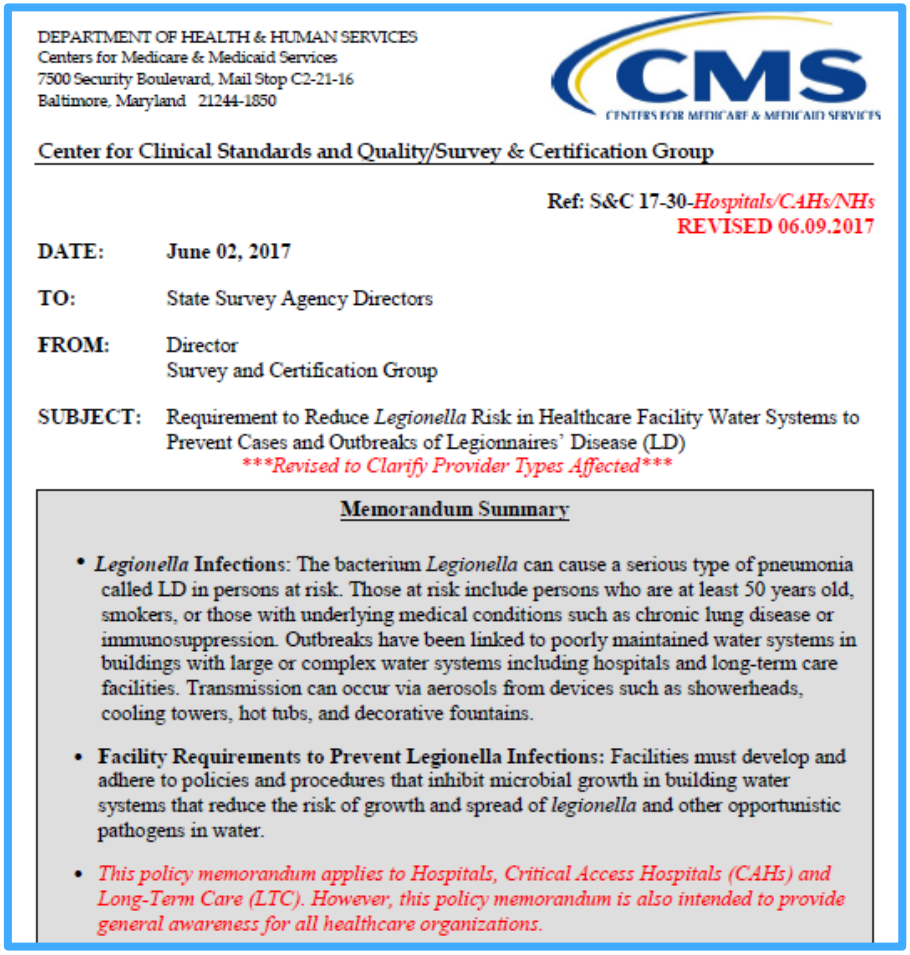
 ISSN 1041-2336

ANSI

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

June 5, 2017

Version 1.1

Developing a Water Management Program to Reduce *Legionella* Growth & Spread in Buildings

A PRACTICAL GUIDE TO IMPLEMENTING INDUSTRY STANDARDS

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

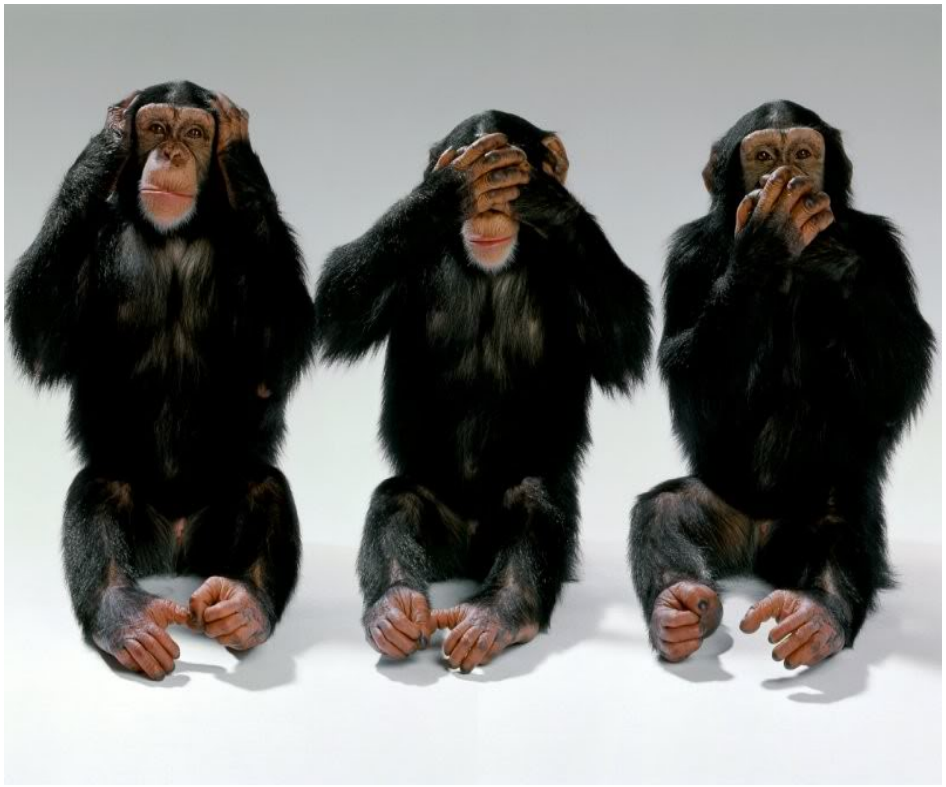
Why Is Detecting *Legionella* Important?

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)

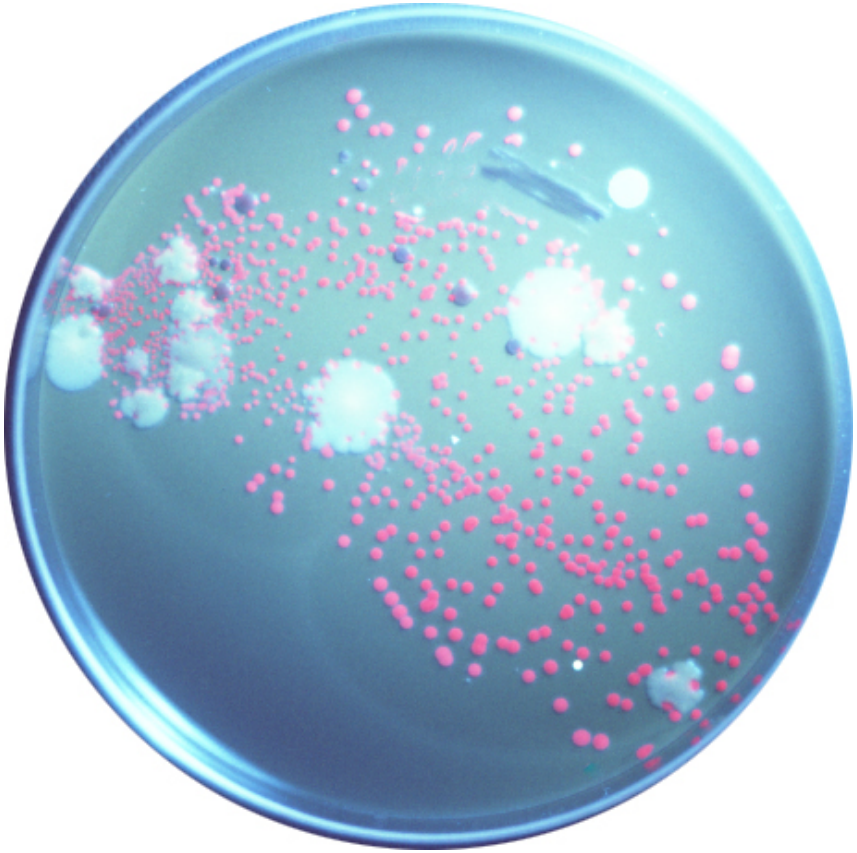
adelaidensis
anisa
beliardensis
birminghamensis
bozemanae
brunensis
busanensis
cardiaca
cherrii
cincinnatiensis
clemsonensis
donaldsonii
drancourtii
dresdenensis
drozanskii
dumoffii
erythra
fairfieldensis
fallonii
feeleii
geestiana
genomospecies 1
gormanii
gratiana
gresilensis
hackeliae
impletisoli
israelensis
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

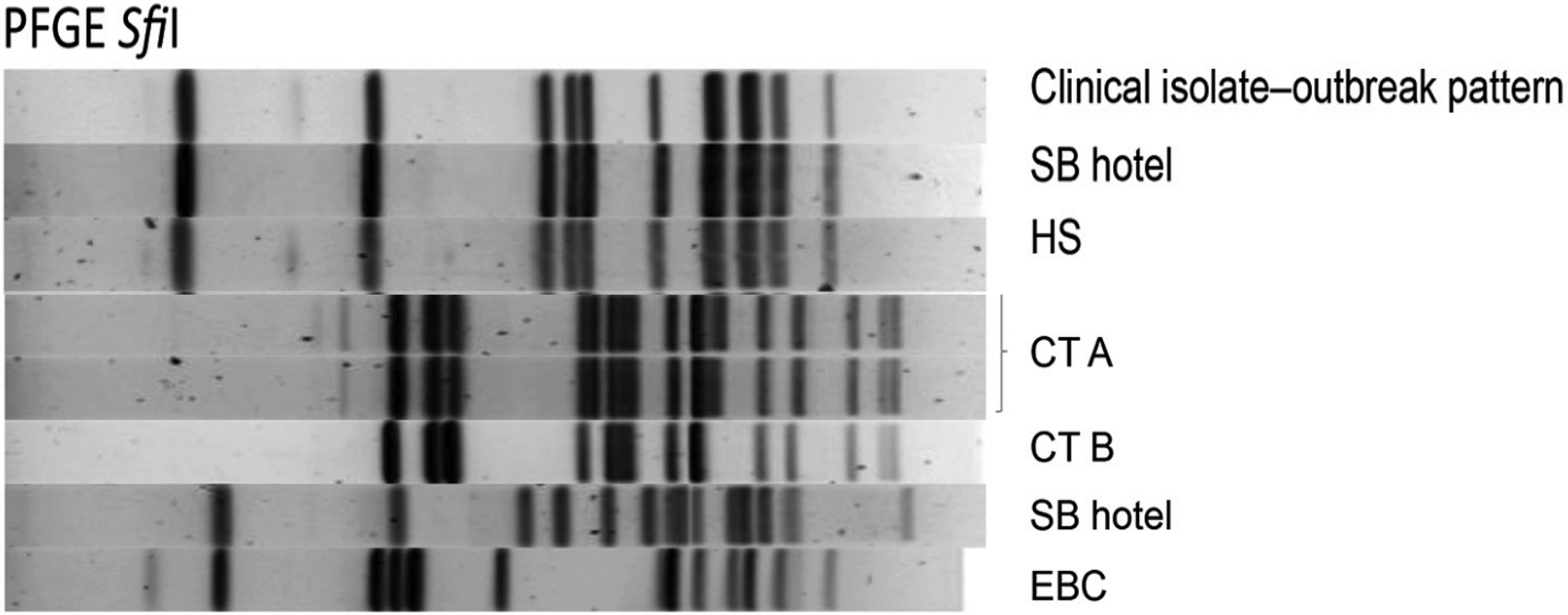
Emerging Infectious Diseases • www.cdc.gov/eid • Vol. 23, No. 11, November 2017

How Was The Outbreak Linked to Hotel Cooling Tower?

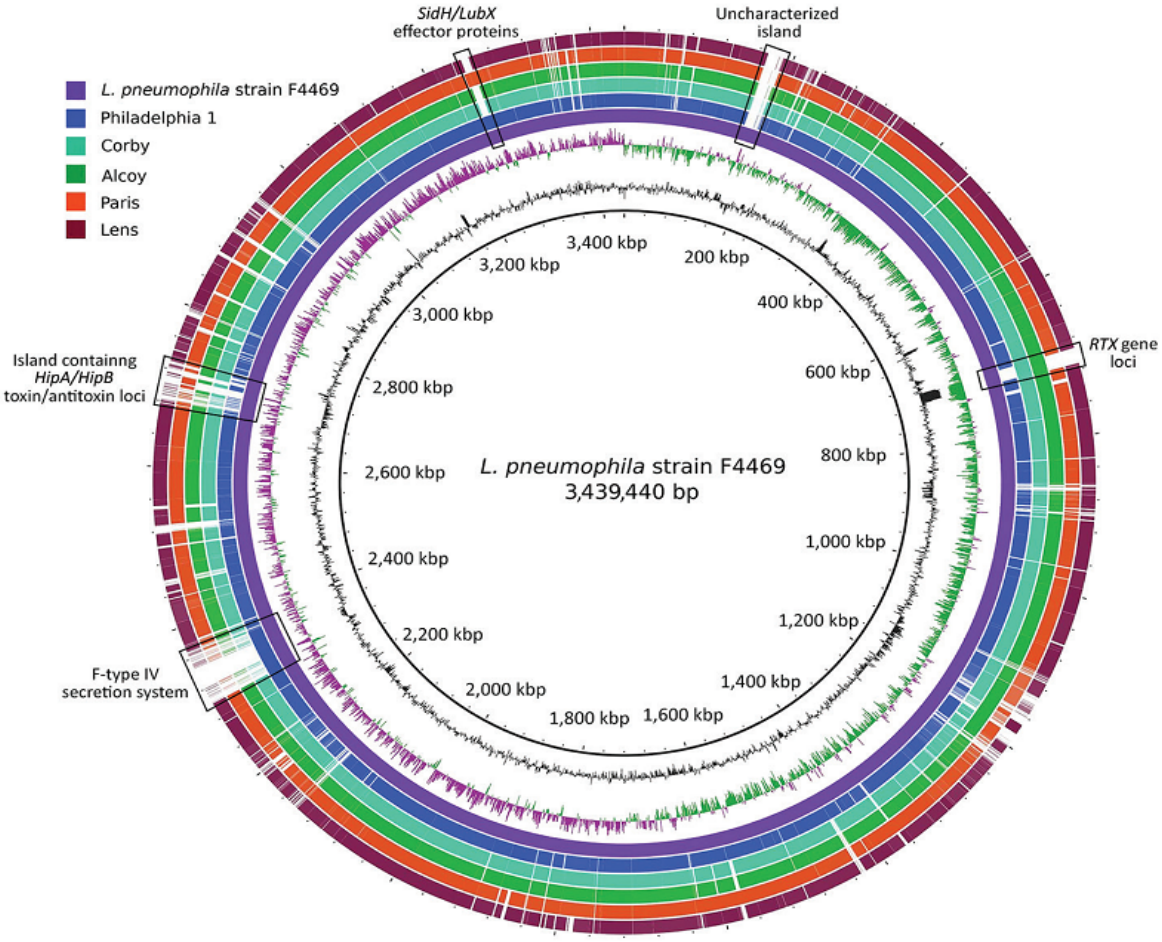
NYC Outbreak in July 2015

- **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

Whole-Genome Sequencing

- *L. pneumophila* serogroup 1 isolates recovered from the South Bronx Hotel (building A) cooling tower were **identical** to the *L. pneumophila* serogroup 1 isolates from 26 patients linked to this outbreak.

SAMPLE COLLECTION

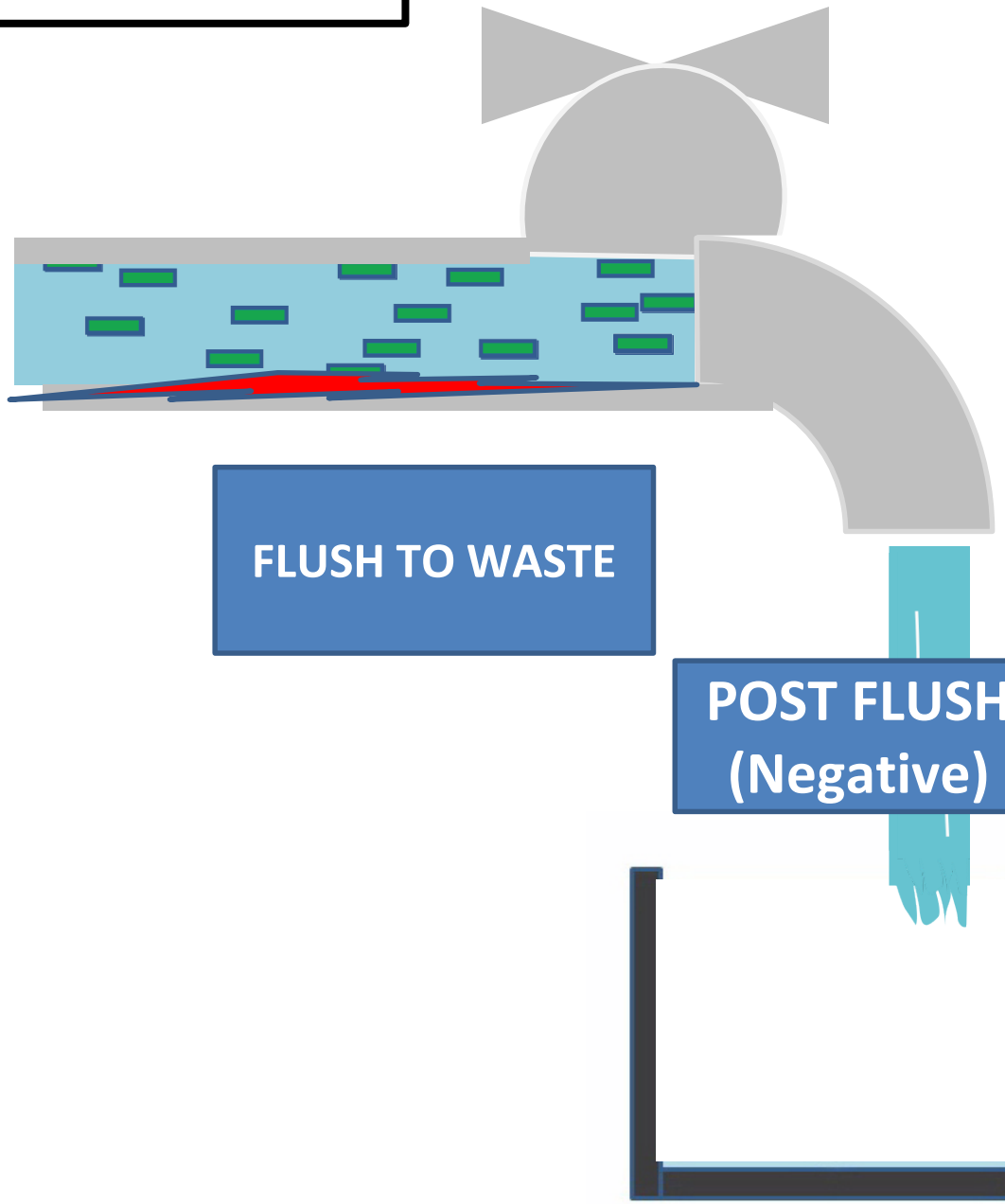
How to Test?

- Method of sample collection and processing can dramatically affect the results
  - Cooling towers
  - Potable water – building water distribution systems
    - Hot water primary reservoir

First Draw Hot Water

- Do not Flush
  - Collect hot water immediately after opening faucet or shower valve
  - Flushing reduces recovery
  - Immediate draw 97.7% positive reduced to 69.1% after 2 min. flush

BIOFILM AT THE PERIPHERY



Courtesy M. Weinbren

SAMPLE COLLECTION: FROM COOLING TOWER BASIN

Test Because You Can't Tell by Looking

Automated dosing of chemical biocides and clean

→

>3000 CFU/mL *Legionella pneumophila* serogroup 1

Laboratory Detection Methods

Legionella Testing According to CDC

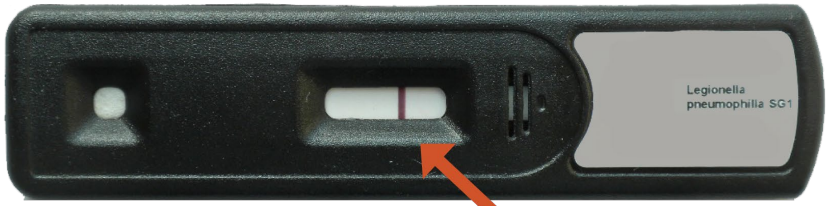
- CDC recommends using a testing method capable of detecting all members of the *Legionella* genus (not just *Legionella pneumophila*) and provides material for typing.
- At the moment, this means culture.
  - ISO 11731 Second edition 2017-05

- Particularly true during an investigation and in the immediate aftermath

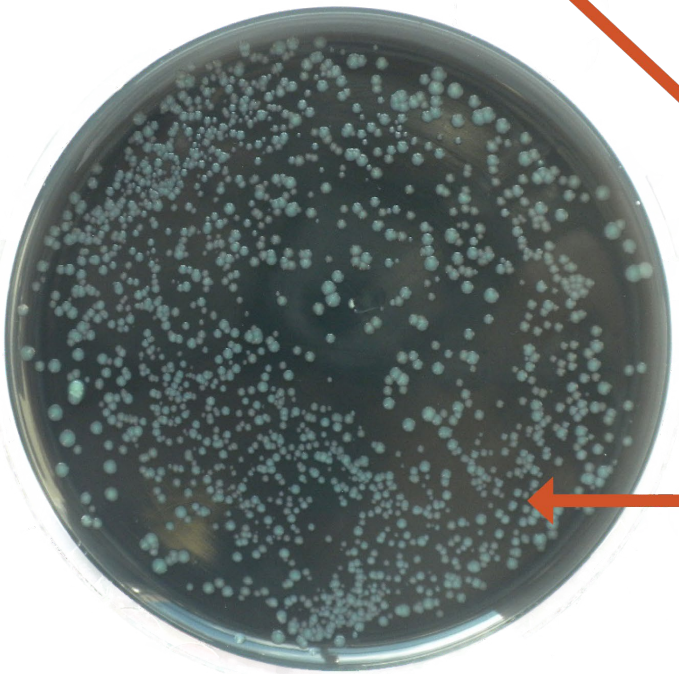
Legionella Testing

- Culture is more reliable (sensitive & specific) than other “rapid tests”
- Preliminary results available in 4 days, final in 7 days.
- Alternative methods/approaches
  - Molecular (qPCR and microarray)
  - Most Probable Number (L. pneumophila only)
  - Immunochromatographic (ICT) test

ICT-Type Test: Quick But Inaccurate?



Fails to detect Legionella pneumophila serogroup 1



> 3,000 CFU/ml

Legionella culture succesfully detects *Legionella pneumophila* serogroup 1

Culture Method

- Industry standard/best practice
  - Standards based
    - ISO 11731 (1&2)
    - ASTM D 5952
    - CDC
    - International – HSE L8 ACP 2013
  - Laboratory Proficiency Programs
    - NY ELAP
    - ELITE is not a traditional proficiency program

Greater Focus On Legionella Prevention

JUNE 2016

CDC Vitalsigns™

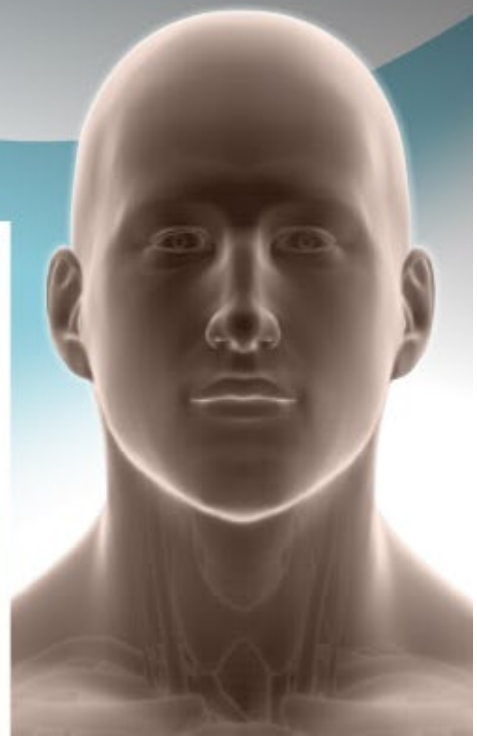
Legionnaires' Disease

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.



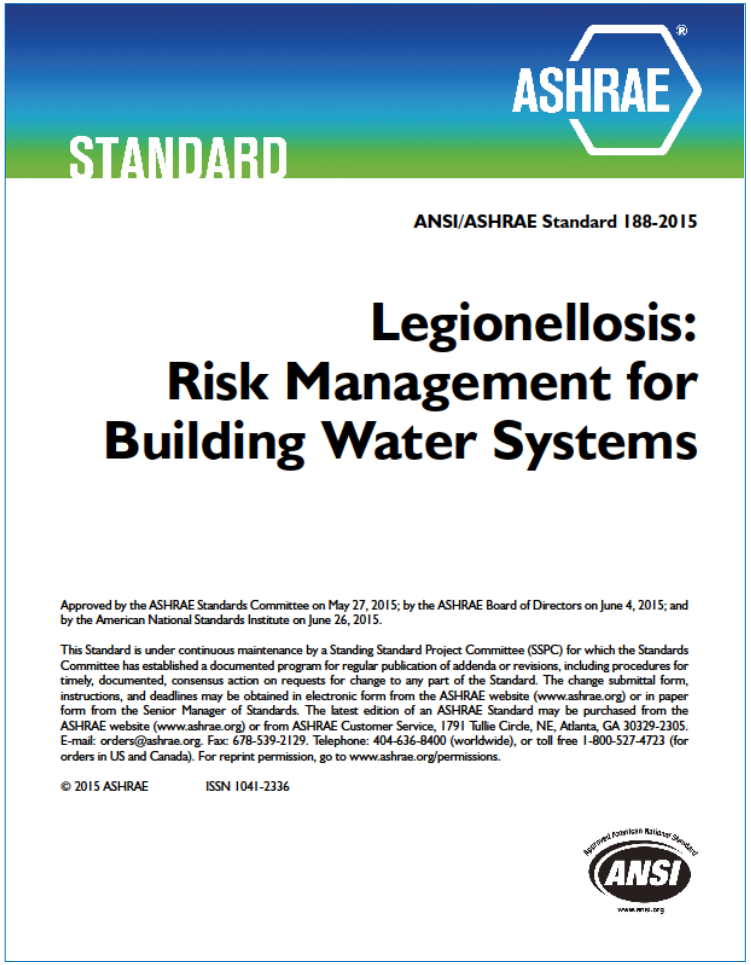
CDC Focuses on Effective Water Management For Legionnaires' Disease Prevention (AKA ASHRAE 188)

ASHRAE Standard 188

- First *Legionella* standard in the United States

- Approved June 26, 2015
- Revised 2018

- Establish minimum Legionellosis risk management requirements for building water systems.



Revised Standard 188-2018

STANDARD

ASHRAE

ANSI/ASHRAE Standard 188-2018
(Supersedes ANSI/ASHRAE Standard 188-2015)
Includes ANSI/ASHRAE addenda listed in Annex D

Legionellosis: Risk Management for Building Water Systems

See Informative Annex D for approval dates.

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. The change submittal form, instructions, and deadlines may be obtained in electronic form from the ASHRAE® website (www.ashrae.org) or in paper form from the Senior Manager of Standards. The latest edition of an ASHRAE Standard may be purchased from the ASHRAE website (www.ashrae.org) or from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: orders@ashrae.org. Fax: 678-539-2129. Telephone: 404-636-8400 (worldwide), or toll free 1-800-527-4723 (for orders in US and Canada). For reprint permission, go to www.ashrae.org/permissions.

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2018 Code-intended Language

FOREWORD

ASHRAE Standard 188 establishes minimum legionellosis risk management requirements for building water systems. The 2018 edition benefits from changes to improve usability and from comprehensive updates that replace permissive language with enforceable, code-intended language to facilitate adoption of the standard for code and regulatory purposes. For a full list of changes to the 2015 edition of Standard 188, see Informative Annex D.

~~*The purpose of ASHRAE Standard 188 is to establish minimum legionellosis risk management requirements for building water systems.*~~

Code Change and Regulations

- ASHRAE Standard 188 is a voluntary standard

- Legionella prevention, detection and control requirements should be incorporated into building and plumbing code

New Responsibilities

Building Owners & Facility Managers

- Responsible for implementing ASHRAE 188 requirements and safeguards to protect against *Legionella*

Water Management team

- Assist building owners with Program development and review, monitoring water systems and results interpretation

Compliance

The building shall be surveyed to determine whether it has one or more of the listed water systems and/or the factors described that relate to risk for Legionellosis.

Building Survey

- ✓ Cooling Tower
- • Spa/Pool
- ✓ Decorative Water Feature
- • Other Aerosol Devices
- • Multiple Housing Units
- ✓ >10 Stories
- ✓ Healthcare
- • Long term Care
- ✓ CMS Compliance

WATER SAFETY AND MANAGEMENT PLAN

Elements of a Water Management Program

Program Team – Persons responsible for Program development and implementation.

Water Systems/Flow Diagrams – Describe potable and non-potable water systems and develop water system-schematics.

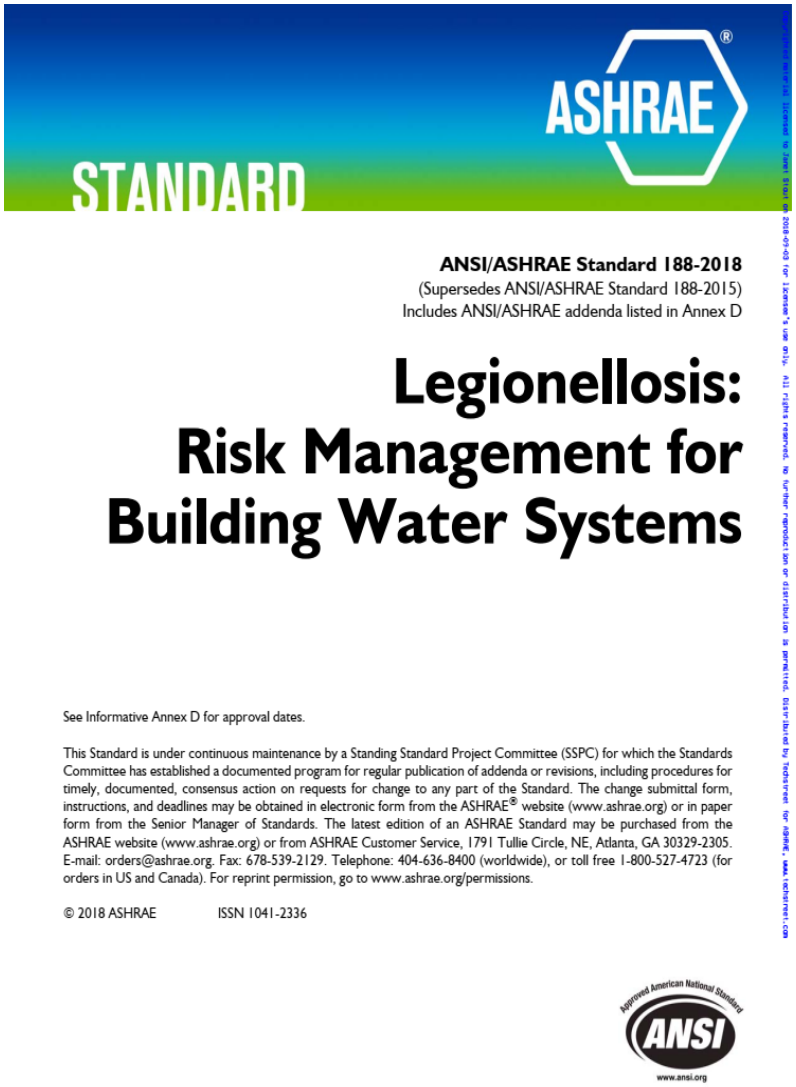
Water System Analysis/Control Measures – Evaluate where hazardous conditions may occur and decide where control measures should be applied.

Monitoring/Corrective Actions – Establish procedure for monitoring whether control measures are within operating limits and, if not, take corrective actions.

Confirmation – Establish procedure to confirm Program is being implemented as designed (verification) and the Program effectively controls the hazardous conditions (validation).

Documentation – Establish documentation and communication procedures for all activities of the Program.

Standard 188-2018 Normative Annex A Healthcare Facilities



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Elements of a Water Management Program

Program Team – Persons responsible for Program development and implementation.

- Infection control
- Facility managers
- Engineering
- Administration
- Water treatment providers
- *Legionella* experts

Executing Your Plans

1. Establish Program Team
2. Determine level of *Legionella* Knowledge and time of team to develop plans
3. Perform site assessment
4. Complete risk assessment report
5. Address assessment recommendations
6. Develop water safety and management plan
7. Implement monitoring
8. Implement validation program
9. Verification by Program Team

Knowledge

The program team shall have

knowledge

of the building water system design and water management

as it relates to Legionellosis

Test Your Knowledge: True or False?

- *Legionella* is ubiquitous (everywhere).
- If chlorine levels at or above 0.5 mg/L in the supply water, *Legionella* is controlled.
- Only old buildings have *Legionella* problems.
- If total bacteria (HPC or ATP) are controlled, *Legionella* is controlled.
- Water and energy conservation approaches minimize *Legionella* risk.
- Legionella is not a concern during construction.

FALSE

Water Safety and Management Plan

CONTENTS

1 *Legionella*

2 ASHRAE 188 Compliance Requirements

3 Program Team

4 Building List

5 Potable Water Systems

6 Cooling Towers

7 Whirlpool Spas

8 Decorative Water Features

9 Aerosol-Generating Equipment

10 Confirmation

11 Contingency Response Plan

12 Designing New Building Water Systems

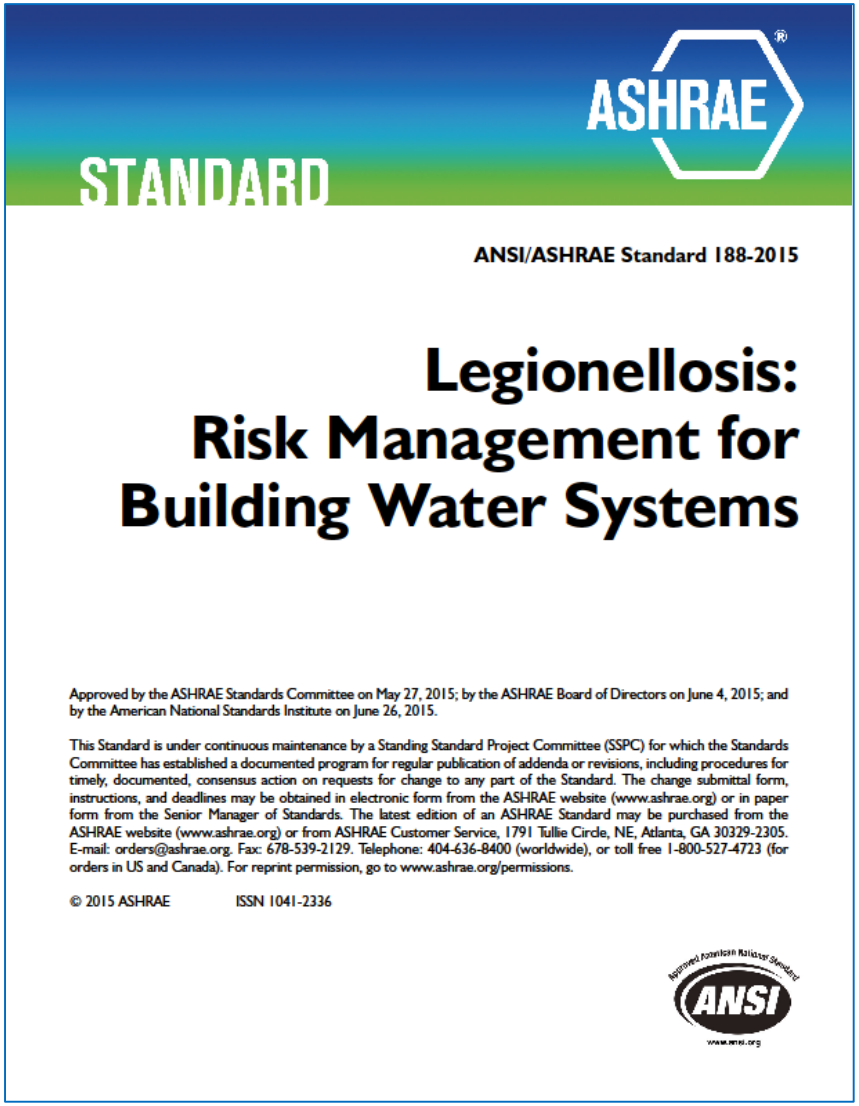
13 Documentation

14 Resources

- Section 8. Requirements For Designing Building Water Systems

8. REQUIREMENTS FOR DESIGNING BUILDING WATER SYSTEMS

8.1 General. When designing for new construction, renovations, refurbishment, replacement, or repurposing of a facility, the following shall be documented:



STANDARD

ASHRAE

ANSI/ASHRAE Standard 188-2015

Legionellosis: Risk Management for Building Water Systems

Approved by the ASHRAE Standards Committee on May 27, 2015; by the ASHRAE Board of Directors on June 4, 2015; and by the American National Standards Institute on June 26, 2015.

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Addresses A Known Risk: Delayed Occupancy

Legionella Outbreak UAB University Hospital

Hematology/oncology Unit

2 patients die at UAB after testing positive for legionellosis

Posted: May 27, 2014 2:10 PM CDT
Updated: Jun 24, 2014 5:30 PM CDT

By WBRC Staff CONNECT

BIRMINGHAM, AL (WBRC) - Two out of eight patients who tested positive for the legionella bacteria have died at UAB, hospital officials confirm.

Legionella is a bacteria that can cause a form of pneumonia called legionellosis, or Legionaire's disease, according to Dr. Loring Rue, UAB's Chief Patient Safety and Clinical Effectiveness Officer.

Rue says most people are exposed to legionella regularly and usually don't get legionellosis, but people with weak immune systems are typically more susceptible to legionellosis.

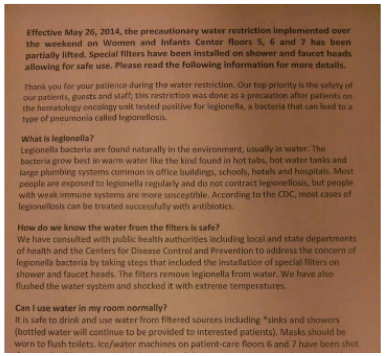
Most people get infected by inhaling the bacteria. It can't be transferred by person to person contact.

After eight patients in the hematology/oncology unit tested positive for legionellosis, UAB Hospital implemented water restrictions in a section of the hospital on Saturday.

The bacteria was discovered in one unit that shares plumbing with two floors. So far, they have not found any new infections outside of that one unit.

The hospital installed filters on shower and faucet heads, flushed the water system and shocked it with extreme temperatures in an effort to make sure the water was safe, Rue said. They also asked patients to wear masks when

Source: WBRC video



Effective May 26, 2014, the precautionary water restriction implemented over the weekend on Women and Infants Center floors 5, 6 and 7 has been partially lifted. Special filters have been installed on shower and faucet heads allowing for safe use. Please read the following information for more details.

Thank you for your patience during the water restriction. Our top priority is the safety of our patients, guests and staff; this restriction was done as a precaution after patients on the hematology oncology unit tested positive for legionella, a bacteria that can lead to a type of pneumonia called legionellosis.

What is legionella?
Legionella bacteria are found naturally in the environment, usually in water. The bacteria grow best in warm water like the kind found in hot tubs, hot water tanks and large plumbing systems common in office buildings, schools, hotels and hospitals. Most people are exposed to legionella regularly and do not contract legionellosis, but people with weak immune systems are more susceptible. According to the CDC, most cases of legionellosis can be treated successfully with antibiotics.

How do we know the water from the filters is safe?
We have consulted with public health authorities including local and state departments of health and the Centers for Disease Control and Prevention to address the concern of legionella bacteria by taking steps that included the installation of special filters on shower and faucet heads. The filters remove legionella from water. We have also flushed the water system and shocked it with extreme temperatures.

Can I use water in my room normally?
It is safe to drink and use water from filtered sources including *sinks and showers (bottled water will continue to be provided to interested patients). Masks should be worn to flush toilets. Ice/water machines on patient-care floors 6 and 7 have been shut

New Unit

- May 2014, 10 cases following completion of new hematology-oncology unit
- *L. pneumophila*, serogroup 1 isolated from 50% (17/34) distal sites (faucets/showers)
- Cases stopped following shock disinfection and installation of Point-of-Use (POU) filters
- Long-term, hot water monochloramine

Retirement Community

Second case of Legionnaire's disease reported at Ellicott City retirement community

Retirement Community Outbreak After Opening in 2016

- Newly constructed buildings officially opened in April
- 2 residents diagnosed with Legionnaire's disease in May and June
- Water restrictions, health dept., news
- Disinfection measures
  - Short-term (hyperchlorination)
  - Long-term supplemental (monochloramine on the hot water system)

Changes In Water Quality

Flint, Michigan

Flint water crisis likely the cause of deadly Legionnaires outbreak

By Sara Ganim, CNN Mar 30, 2017

Water Quality in Flint Michigan

That's in Your Water!

Cross section of 4 inch pipe from hospital hot water system

Weather and Legionnaires' Disease

Weather-Dependent Risk for Legionnaires' Disease, United States

Jacob E. Simmering, Linnea A. Polgreen, Douglas B. Hornick, Daniel K. Sewell, Philip M. Polgreen

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

Wet Weather and Legionnaires' Disease?

Rain, flooding likely led to spike in Legionnaires' disease

Reports of Legionnaires' disease follow heavy rains.

Comments 0 Recommend 4 Share 1 0

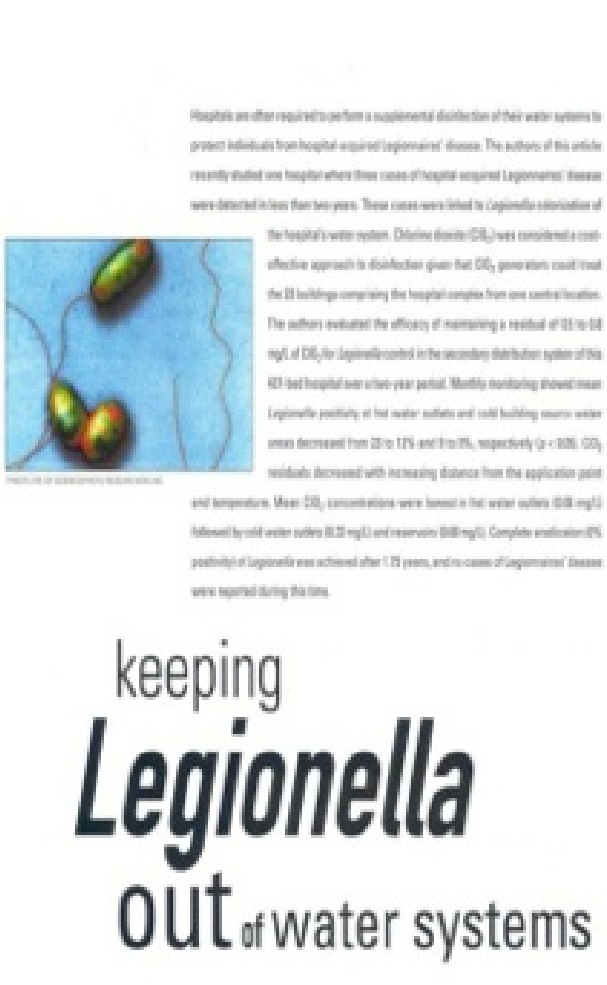
By Tim Darragh, Of The Morning Call
11:42 P.M. EDT, OCTOBER 17, 2011

All that rainfall in September may have left more than wet basements here and flood-wracked communities in northeast Pennsylvania.

It also appears it was at least partly responsible for a record spike in Legionnaires' disease, a water-borne bacterial pneumonia that can be fatal to some people.

I Have Legionella in My Building…
Now What?

DISINFECTION APPROACHES


keeping
Legionella
out of water systems

DISINFECTION OPTIONS

Secondary Disinfection Methods

- Thermal shock treatment (heat & flush)
- Shock chlorination (>10 mg/L residual), may require water tanks to be 20-50 mg/L
- Continuous chlorination (2-4 mg/L)
- Copper-silver ionization (continuous and short-course)
- Chlorine Dioxide (ClO2)
- Monochloramine
- Point-of-use filtration

Evidence-based Approach to Evaluating Efficacy

- Do some research – don't assume the salesperson will tell you everything you need to know
  - Consult with experts
  - Get information from other users of the technology
  - Don't "google" it!

Efficacy of Disinfection Methods

- Testing should be performed to demonstrate efficacy:
  - Baseline testing prior to installation and start-up
  - Test within 2-4 weeks of start-up
  - Test quarterly for one year
  - Adjust monitoring schedule based upon performance and patient risk

Field Evaluation: Monochloramine

INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY NOVEMBER 2014, VOL. 35, NO. 11

ORIGINAL ARTICLE

Evaluation of A New Monochloramine Generation System for Controlling *Legionella* In Building Hot Water Systems

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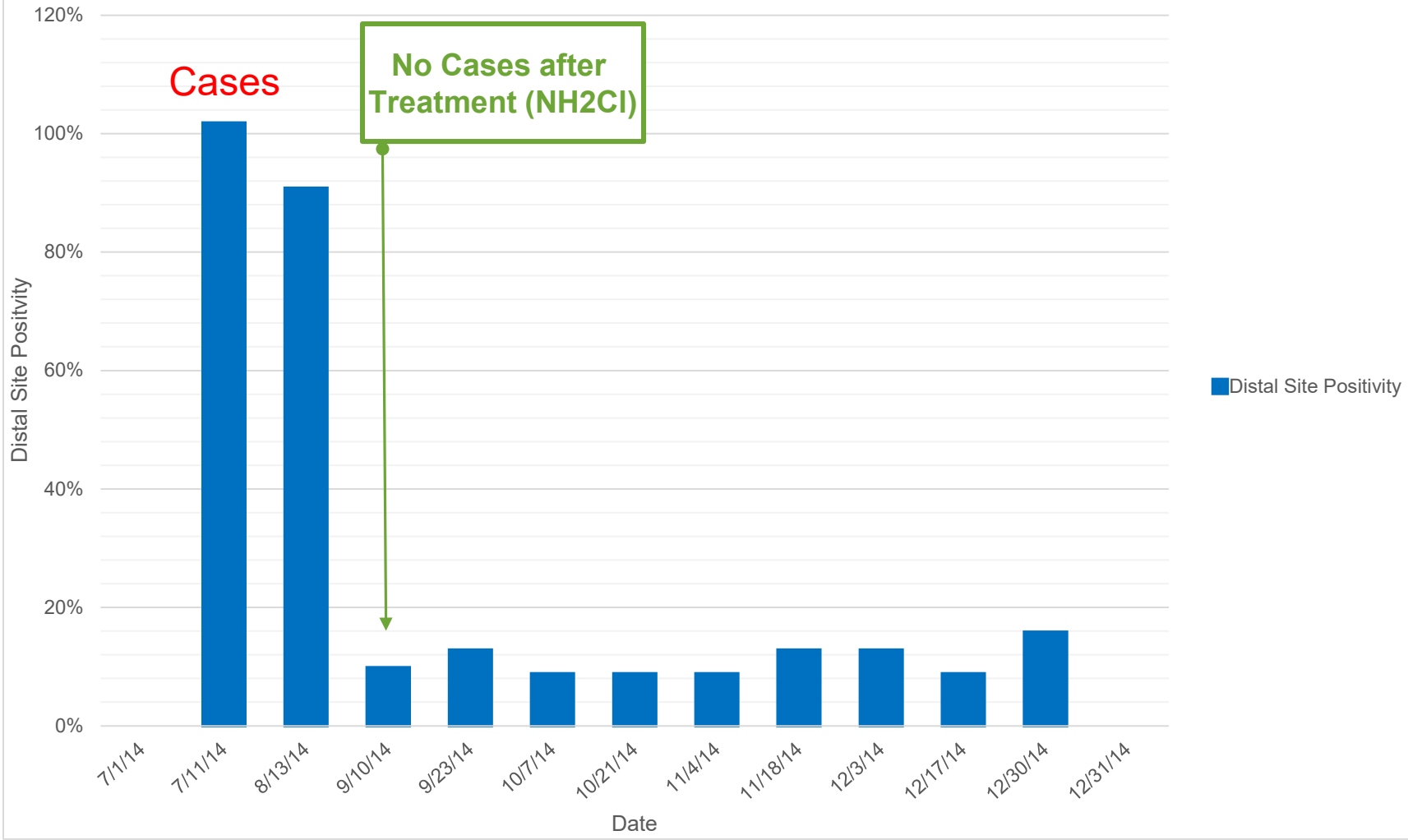
Marilyn M. Wagener, MS;[5] John Goepfert;[2] James Bond;[2] Joseph Hannigan, CWT;[6] Denzil Rogers[2]

High (>30%) *Legionella* Distal Site Positivity And Cases Prior to Treatment



Disinfection Review

FRANK P. SIDARI III, JANET E. STOUT, SCOTT DUDA, DOUG GRUBB, AND ALAN NEUNER

Maintaining *Legionella* control in building water systems

THIS ARTICLE REVIEWS HOW *LEGIONELLA* AND OTHER WATERBORNE PATHOGENS CAN PRESENT A RISK TO CONSUMERS OF POTABLE WATER. SECONDARY

Legionella and other waterborne pathogens can present a risk to consumers of potable water. In particular, building hot water systems have been established as the primary reservoir for bacteria linked to cases of Legionnaires' disease (LD). These systems provide ideal conditions for *Legionella* proliferation because of their elevated temperature and lack of disinfection residual. Control of *Legionella* in potable water systems has become a focus for health care facilities because they serve a population that is particularly susceptible to LD from underlying health conditions, such as suppressed immune systems. In

Journal Am Water Works Assoc 2014; 106(10): 24-32

Summary

- Potable Water systems, especially in hospitals (and other buildings) with complex hot water systems, are the most important source of *Legionella* transmission.

Summary

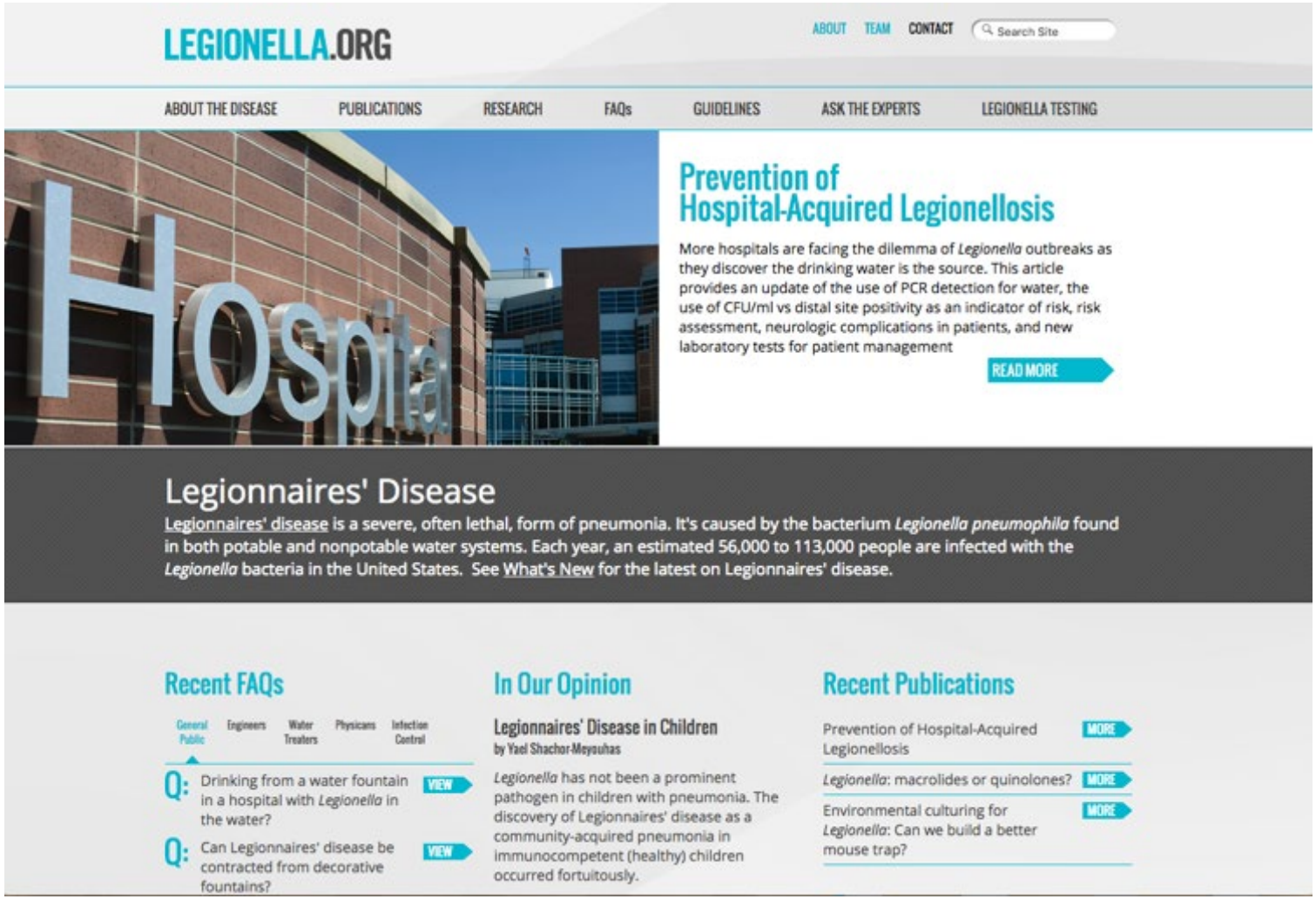
- Each building owner must assess the risk and validate their water management plans to demonstrate control of the hazard (*Legionella*).

- Determining the risk or validating a water management plan cannot be done without testing for *Legionella*.

Any organization that disputes this
and tells people
not to test
their water systems
as part of an effective prevention
strategy
is at best foolish
and at worst endangering lives

Janet E. Stout, PhD, September 13, 2018
Plumbing Engineer: Vol 46 (9)
https://www.phcppros.com/publications/1-plumbing-engineer

Resources
www.legionella.org



Plumbing Engineer Magazine

https://www.phcppros.com/articles/8058-ending-legionnaires-disease

Ending Legionnaires' Disease

Health care facilities should have a regimen of testing water systems and use supplemental disinfection to control the *Legionella* bacteria.

I am a Legionellologist. What is that, you ask? It's the term for an infectious disease microbiologist who has been studying Legionnaires' disease for more than 30 years. And because I'm a Legionellologist, I have the long view of our path to prevention of Legionnaires' disease. It may seem elusive to many and perhaps a fool's errand. But I am a glass-half-full type of person and my mission is evidence-based, grounded in science and guided by field experience.

In 1982, the results of my first study of *Legionella* bacteria in hospital plumbing systems were published in the *New England Journal of Medicine*. It was a groundbreaking study because my colleagues and I identified the hospital hot water system as the source of the outbreak of Legionnaires' disease at the Pittsburgh VA hospital. At the time, cooling towers had been thought to be the principal source of exposure. In the midst of an endemic, clinicians and researchers at the VA implemented a robust *Legionella* program that prevented cases for more than 20 years. Few can make this claim.

Now, 36 years later, we know that potable water, especially the warm-water systems of large buildings such as hospitals, is the primary source of transmission of this deadly form of bacterial pneumonia.

Among outbreaks investigated by the Centers for Disease Control and Prevention (CDC), exposure to *Legionella* bacteria from water distribution systems of buildings was responsible for 56 percent of the outbreaks; cooling towers caused only 22 percent of cases.

Health-care facilities are especially vulnerable. A review of 27 Legionnaires' disease outbreaks investigated by the CDC during 2000–2014 indicated that health-care-associated Legionnaires' disease accounted for 33 percent of the outbreaks, 57 percent of the cases and 85 percent of deaths. In addition, 85 percent of all Legionnaires' disease outbreaks were attributed to water system exposures.

Unfortunately, Legionnaires' disease is on the rise. The CDC found that there are about 6,000 new diagnoses of Legionnaires' annually in the United States; rates of the disease are up a staggering 450 percent since 2002. Dr. Laura Cooley, a medical epidemiologist with the CDC, spoke at the 2017 ID week conference on the causes of the rising number of cases of Legionnaires' disease stating that the reported cases were up by nearly 300 percent. You can view a video of her comments at bit.do/LauraCooley.

What's more, the incidence of reported Legionnaires' disease cases in the U.S. tripled between 2000 and 2009, with medical costs estimated at $321 million per year. This

Pa Patient Saf Advis 2017 Sep;14(3).

Legionella: Could This Potentially Deadly Bacteria Be Lurking in Your Facility's Water Distribution System?

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THANK YOU

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