Waterborne Pathogens & Proactive Prevention

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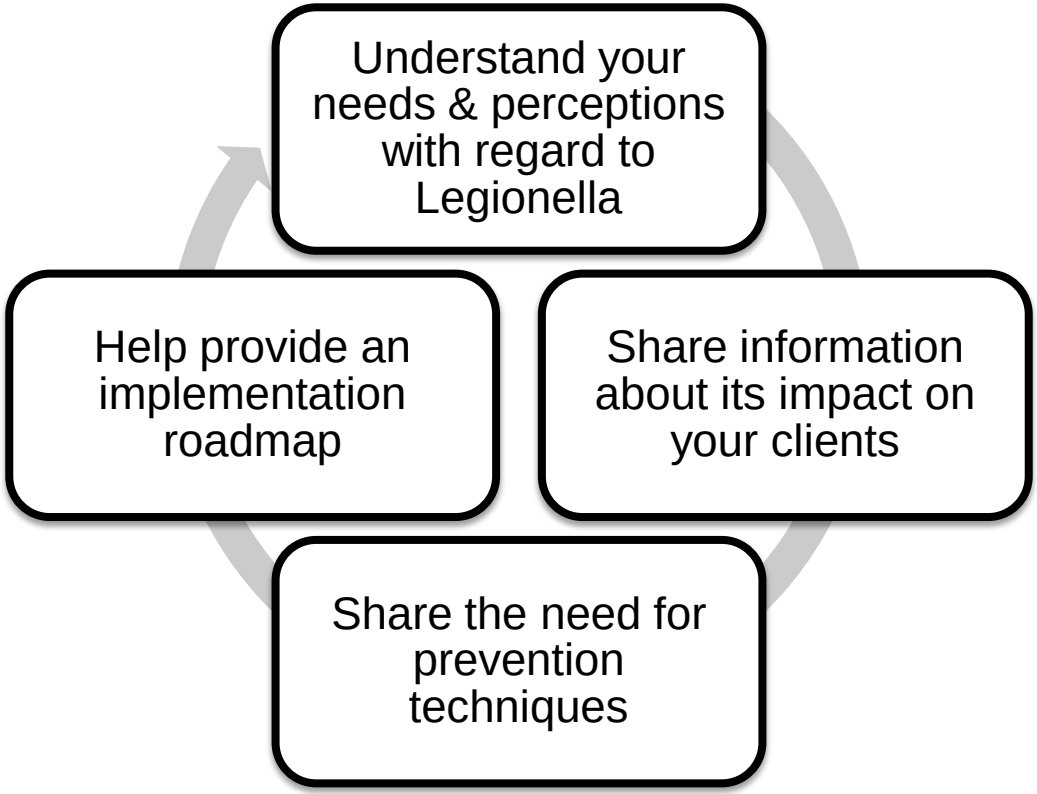
Agenda


Understand your needs & perceptions with regard to Legionella
Share information about its impact on your clients
Share the need for prevention techniques
Help provide an implementation roadmap

First Issue

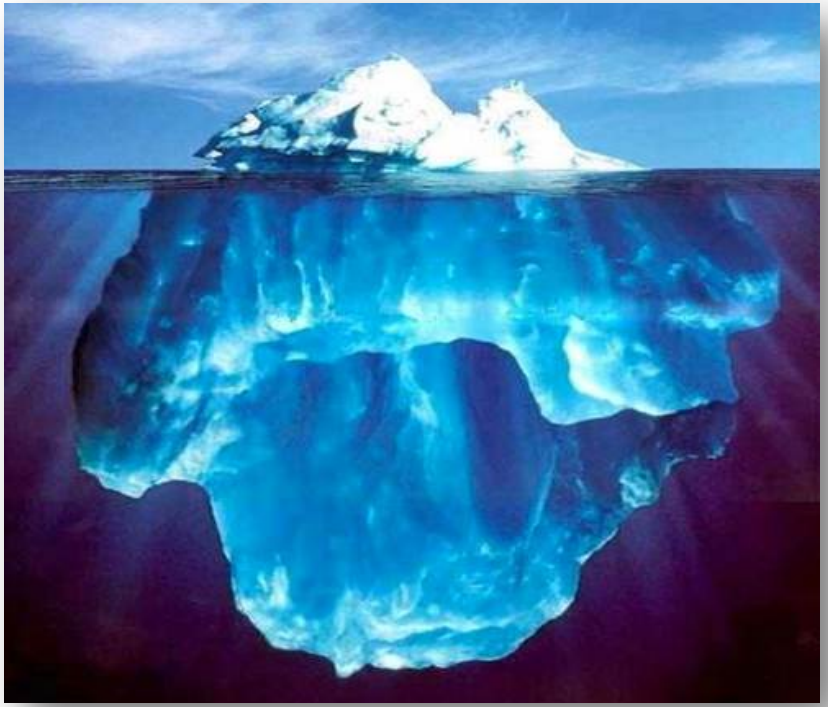
How Can I Help You?

How Big is the Problem?

Legionnaires Disease

- 221 American Legion members were struck
- 34 Died
- Wasn’t the first outbreak!
- The bacteria was isolated in 1947
- It had no name until the Bellevue Stratford disaster

How Big is the Problem?



Outbreaks Prior to 1976

- 1965
  - St. Elizabeth's Hospital – Washington, DC
  - 81 patients become ill & 14 died
- 1974
  - Odd Fellows Convention at Bellevue Stratford Hotel – Philadelphia, PA
  - 20 attendees became ill & 2 died

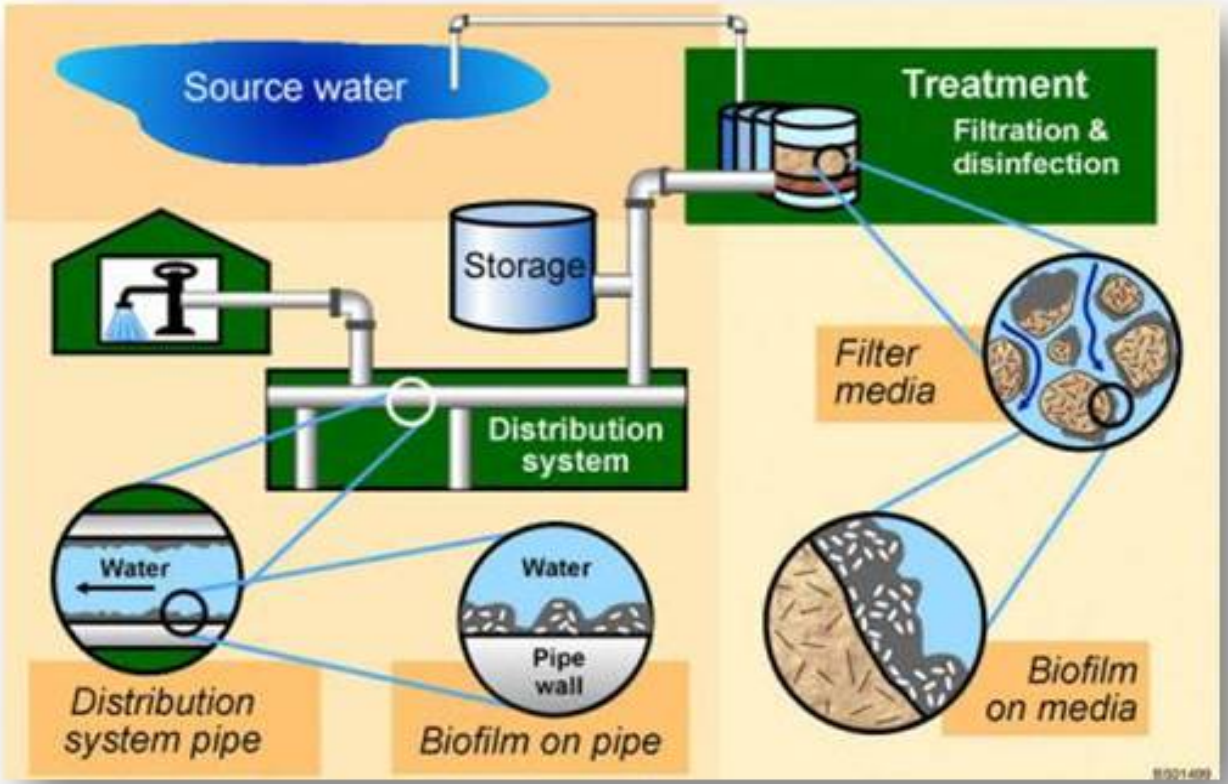
The Culprits

- Showers
- Aerated faucets
- Misters
- Humidifiers
- Whirlpool baths
- Vegetable sprayers
- Handheld sprayers
- Water features

The Pathogens in our Pipes

Legionella	E. Coli & GI Pathogens	Pseudomonas
Amoeba Resistant	M. Avium	Microorganisms

How Do Pathogens Get Into Our Pipes?



How Do Pathogens Get Into Our Pipes?

- What is Biofilm?
  - Slime on the inside of the pipe
  - Microorganisms which allow cells to adhere
  - Bacteria attach to the biofilm
  - The biofilm forms a layer of protection for the bacteria
  - Bacteria can multiply in the biofilm

Case Studies – Waterborne Bacteria

- The federal Centers for Disease Control and Prevention say a rare amoeba that caused the August death of a child in south Louisiana has been found in five locations in a north Louisiana water system.

- The state Department of Health and Hospitals said Tuesday the CDC confirmed the presence of the Naegleria fowleri amoeba in five places in DeSoto Parish Waterworks District No. 1, which is one of 14 water systems in the parish.

Case Studies – Waterborne Bacteria

- On April 18th, 2014 the Duval County Health Department in Jacksonville, Florida issued a health advisory after Legionnaires' disease was identified in three residents of an elder care facility. Health officials collected water samples from the facility's water systems.

- The Baltimore City Health Department is investigating two cases of laboratory-confirmed Legionnaires' disease at a senior living facility. Both patients reside at the Apostolic Towers Apartments, a senior housing apartment building with 149 units located at 201 N. Washington Street. One case occurred in March 2014, and the other case occurred last week. Both patients required hospitalization and one of the individuals is currently admitted to an area hospital.

- In August, 2013 Health officials have connected the death of an elderly woman in northwest Alabama on Thursday to an outbreak of Legionnaires' disease, a serious and life-threatening type of pneumonia. There were 13 lab-confirmed cases of Legionnaires' at a nursing home in Florence, a city 206 miles north of Montgomery.

Case Studies – Waterborne Bacteria

- Windshield washer fluid may be a breeding ground for bacteria that causes the deadly pneumonia known as Legionnaires' disease.

- Previous studies have tied riding in automobiles to the illness, though researchers didn't know how or why it happened. An investigation into fluid dispersed by school buses in Arizona seems to have provided the answer, according to research released on May 18, 2014 by the American Society for Microbiology at its meeting in Boston.

Healthcare Assumptions

“It ain’t what you don’t know that gets you into trouble. It’s what you know for sure that just ain’t so.”

MARK TWAIN

Healthcare Assumptions

- The lights will turn on
- The water is safe

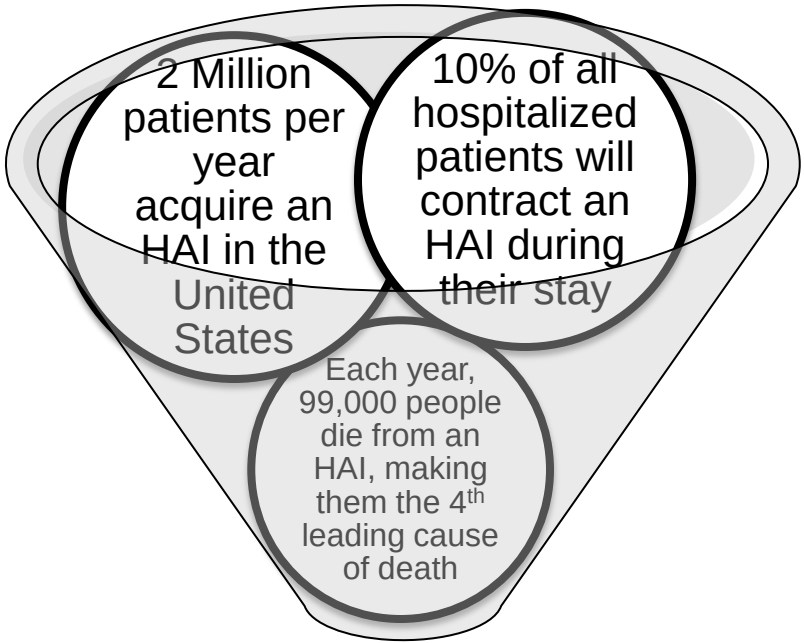
Healthcare Assumptions

How Big is the Problem?

The Joint Commission Definition of Risk

- Proximity to the Patient
- Probability of Harm
- Severity of Harm
- Number of Patients at Risk

Healthcare Acquired Infections (HAIs) are expensive…



$40,000,000,000.00

Pseudomonas (p. aeruginosa)

20% of ALL hospital acquired pneumonias

are caused by Pseudomonas infections

51,000 REPORTED CASES EACH YEAR,

36-42% caused by CONTAMINATED WATER

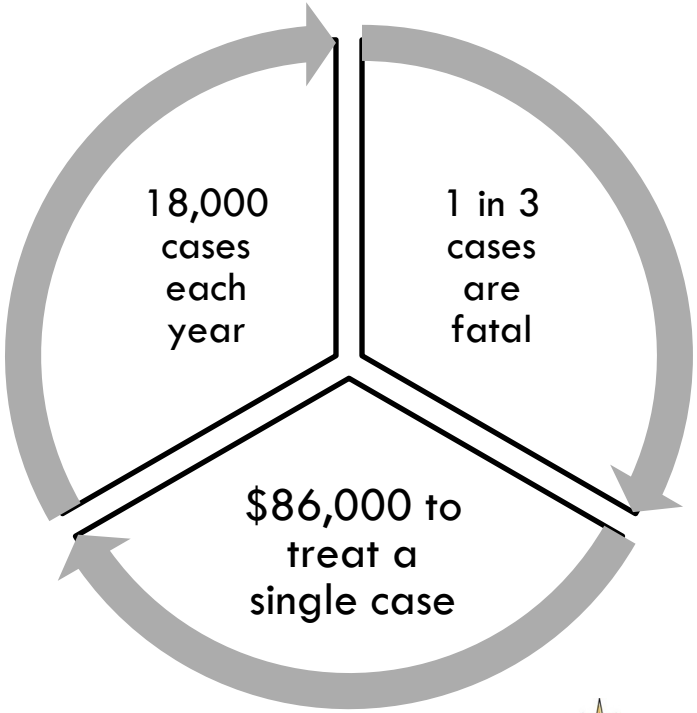
One study found that treating your water can result in a

56% decrease in cases EACH YEAR

Legionella

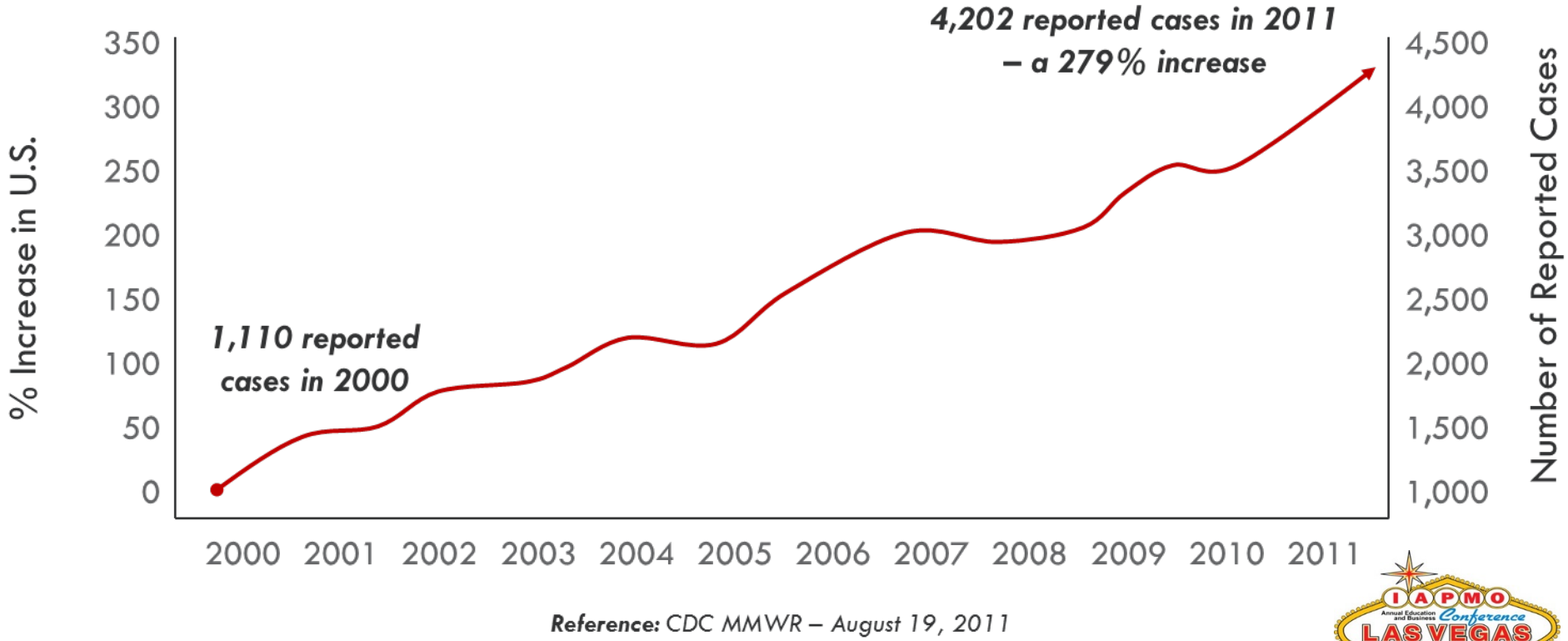
"Up to 70% of ALL building water systems in the United States may be contaminated with *Legionella*."

-Dr. Janet Stout, 2012



CDC – Legionnaires' Disease Increase

More than 22,000 cases reported over the past 10 years



Reference: CDC MMWR – August 19, 2011

How Big is the Problem?

- 270 people die every day from HAIs.
- That is one full 767 crashing every day.

Common Thread - Healthcare

- Legionnaires Disease is a common healthcare acquired infection or HAI
- Many incidents go unreported
- Hospitals don’t look for Legionnaires Disease often with HAI

How Do Healthcare Institutions Get Paid?

- DRG or Case Based Reimbursement
  - Payment for a case regardless of amount of work performed – **FIXED REIMBURSEMENT/CASE**
  - Less work equals more profit
  - Reduce Length of Stay (LOS)

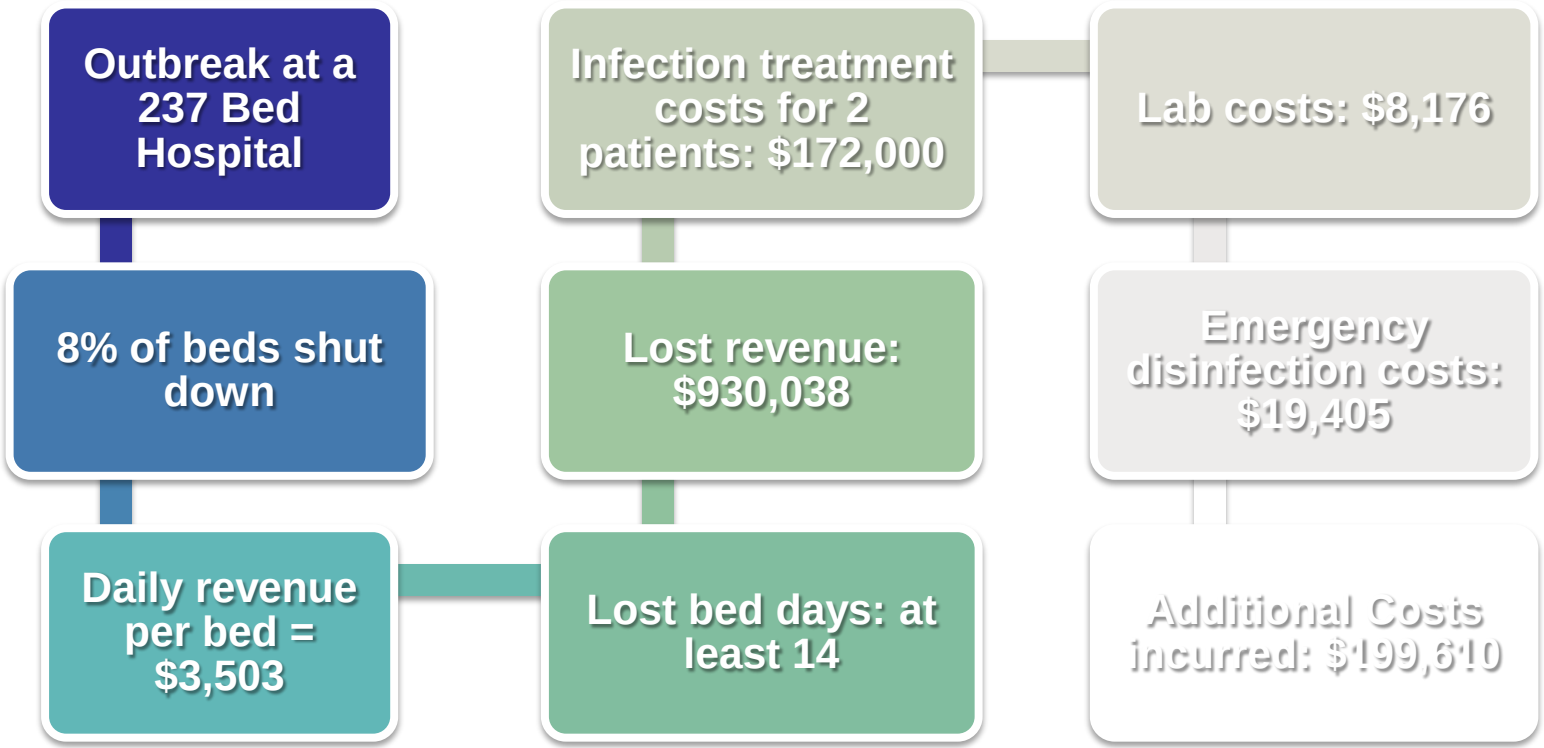
What is the Revenue Impact of HAIs

- HAIs = ↑LOS
- ↑LOS = ↓Throughput
- ↓Throughput = ↓↓ Revenue

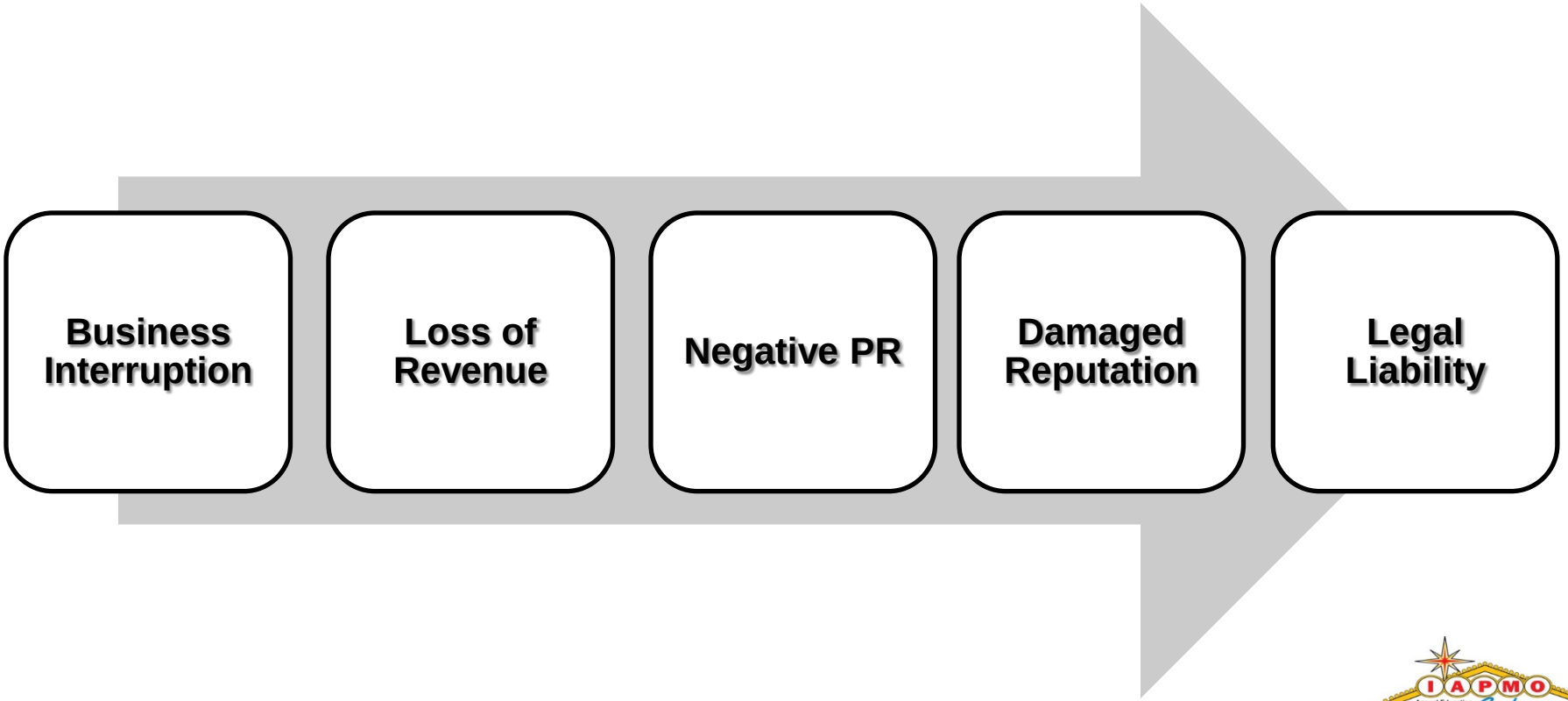
How Reducing HAIs helps reduce LOS & Increase Revenue

	Base Condition	Improvement Scenario #1	Improvement Scenario #2
Calendar Days	365	365	365
Avg LOS/Case	5	4.9	4.8
Case Capacity/Bed	73	74.5	76
AVG Revenue/Case	$20,000	$20,000	$20,000
Total Revenue/Bed	$1,460,000	$1,490,000	$1,520,000
Increased Bed Value	0	$30,000	$60,000
100 Bed Hospital	0	$3,000,000	$6,000,000
500 Bed Hospital	0	$15,000,000	$30,000,000

Business Interruption Analysis



Outbreak Repercussions



Why Is Legionella on People's Radar Screens?

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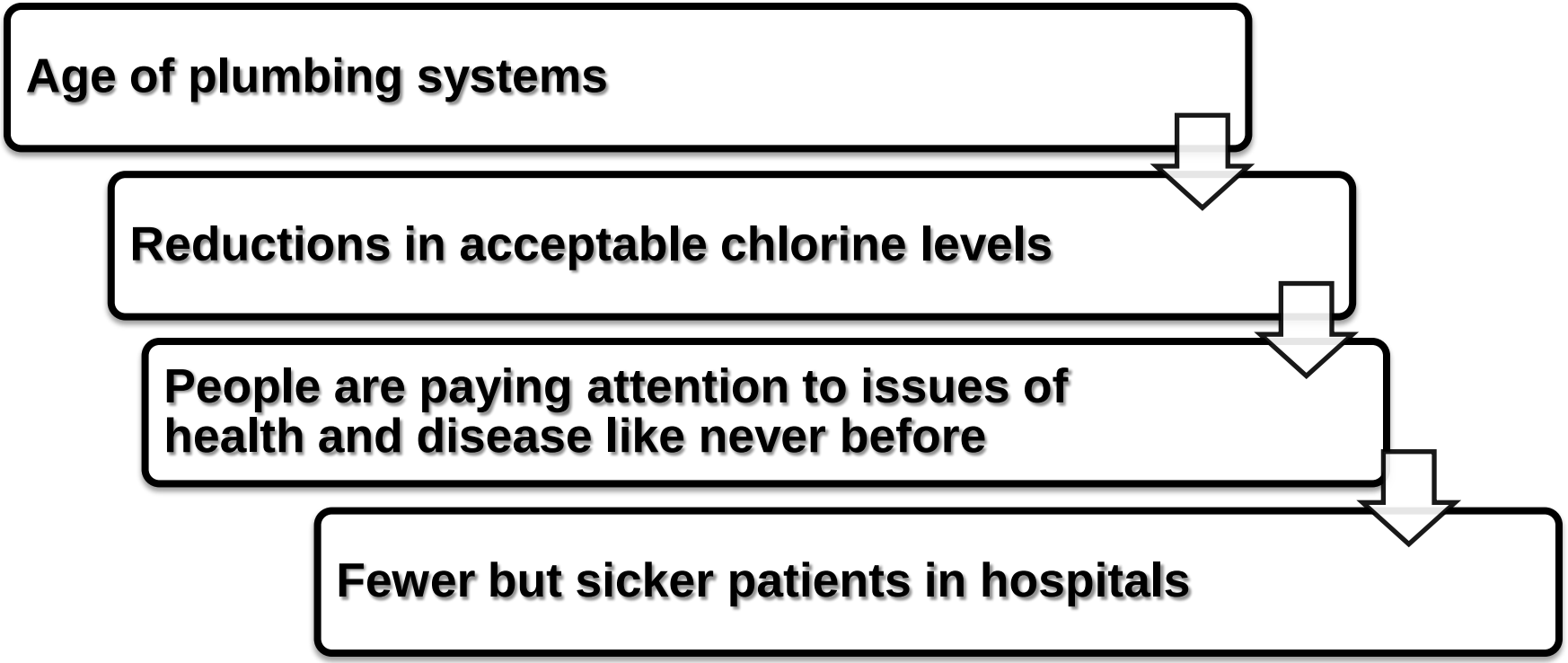


ASHRAE Standard 188

Legionellosis: Risk Management for Building Water Systems

Approved by the American National Standards Institute on June 26, 2015

Official Release: ***https://ashrae.org/news/2015/legionellosis-standard-provides-guidance-on-risk-management-requirements***

ASHRAE Standard 188

Who is affected? All buildings with one of more of the following:

- Cooling Towers
- Spas, saunas, decorative fountains, misters
- 10 or more floors
- All healthcare facilities
- Housing individuals over the age of 65

Prevention Strategies

What should you do?

- Define Water Safety as being ***Critical Maintenance.***
- ***Critical Maintenance*** is the use the specific paths to schedule and sequence their activities.
- The employees know which step precedes which and which succeeds which and can therefore get ready accordingly.

What should you do?

- Maintenance of the Water System is about Protection of the users and Accountability to the stakeholders.
- Begin to think of your water supply safety to be as critical as the blood supply.
  - *From a usage perspective it is more so!*
- Everyone in your facility will be affected by your water supply.

Prevention Strategies

Prevention Strategies

- Point of Use Filtration
- Thermal Heat & Flush
- Ultra Violet
- Copper Silver Ionization
- Hyper Chlorination
- Chlorine Dioxide
- Chlorine Injection

Prevention Strategies

Prevention Strategies - Hot Water

- ASPE research indicated 131˚F as the minimum temperature to kill Legionella
- Above 122˚F there is no growth
- Higher temperatures will kill Legionella faster
- Most hot water becomes tempered

Prevention Strategies - Chlorination

- 4 to 6 ppm of chlorine only provides 90% kill of Legionella bacteria
- Drinking water is approximately 0.75 ppm of chlorine
- Chlorine dioxide can damage the plumbing components

Prevention Strategies – Ultraviolet Radiation

- Good at controlling bacteria
- Long contact time may be required
- Maintenance of system is high
- Filter required ahead of UV unit

Prevention Strategies – Copper Silver Ionization

- Copper silver ionization is one of the most effective means of killing Legionella bacteria
- Systems inject small quantities of copper and silver into the water

Prevention Strategies – Copper Silver Ionization

The Ionization Process

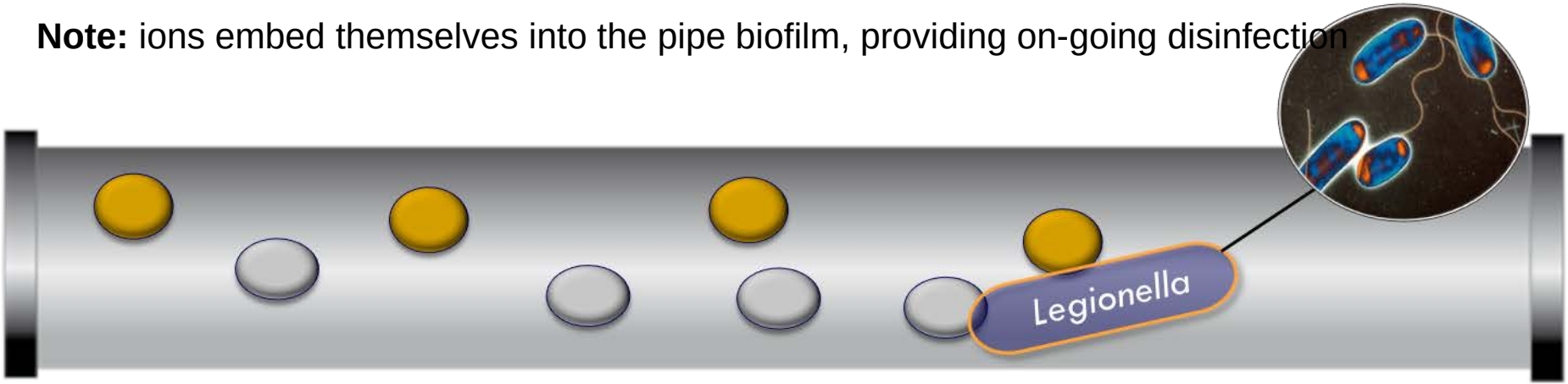
1. Water passes through the flow cell chamber
2. A direct current is applied across the electrodes, creating positively charged copper silver ions
3. The ions seek out bacteria throughout the entire plumbing system, providing on-going disinfection

Prevention Strategies – Copper Silver Ionization

The Ionization Process

4. The positively charged copper silver ions seek out the negatively charged bacteria
5. Copper weakens the bacteria cell wall
6. Silver causes cell lysis (death)

Note: ions embed themselves into the pipe biofilm, providing on-going disinfection



Plumbing Practices

- Avoid stagnant sections of piping
- Avoid section of the water piping that would allow the growth of biofilm
- Consider components that have stagnant water
  - Shower heads
  - Aerators

Plumbing Practices

- **Higher Water Temperatures**
  - Water temperature is 145˚F, with thermostatic mixing valve
  - Downstream temperature is still in a range of Legionella growth
- **ASSE 1017 – Thermostatic Mixing Valve**
  - If water heater is raised above 124˚F a thermostatic mixing valve is necessary
  - Valves must be located near the water heater
  - Water heater temperature should be above 140˚F
  - Downstream temperatures are prone for Legionella growth

Energy Conservation vs. Legionella

- Energy conservation advocates recommend turning the water heater temperature down
- This can increase the growth of Legionella in the water heater
- There must be a balance between safety and energy conservation
- Don’t forget scald protection

Plumbing Practices

- **Hospitals – No Aeration**
  - Use laminar flow aerators or no aerators on faucets in hospitals
  - Avoid having any spray on outlets that can aerate tempered water

Plumbing Practices

- **Supermarket Misters**
  - Supply misters directly with cold water
  - Is a reservoir is provided with the unit, establish a maintenance policy
  - Clean reservoirs once a week

Plumbing Practices

- **Outdoor Misters**
  - Some recommend avoiding the use of outdoor cooling misters.
  - Use only cold water.
  - Drain water supply in supply pipes to prevent warm stagnant areas for biofilm growth.
  - Have a routine cleaning program.

Plumbing Practices

- **Whirlpools & Hydro Therapeutic Tubs**
  - Empty tubs after every use.
  - Educate customer on maintenance.
  - Don’t fill display models with water and operate for days.

Plumbing Practices

- **Automatic vs. Manual Faucets**
  - Johns Hopkins study raised concerns with automatic faucets.
  - Comparison was to much older manual faucets.
  - Internal components of any faucet can have biofilm growth.
  - Lower flow rates don’t clean component like previous faucets.
  - Don’t shy away from automatic faucet.

Secondary Water Disinfection in Context

Questions?

Thank you!