



Describe the Building



Bill Pearson
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Describe the Building

WATER SAFETY (RISK) MANAGEMENT STEPS



ROLES & RESPONSIBILITIES



WRITING THE SUMMARY



DESCRIBE THE BUILDING



IDENTIFY RISK



MITIGATE RISK



CORRECTIVE ACTIONS



DOCUMENTATION



RESOURCES & TOOLS

Describe the building



ASHRAE 188 WMP Core Elements: 2. Describe System



- PROGRAM TEAM**—Identify persons responsible for Program development and implementation.
- DESCRIBE WATER SYSTEMS/FLOW DIAGRAMS**—Describe the potable and nonpotable water systems within the building and on the building site and develop water-system schematics.
- ANALYSIS OF BUILDING WATER SYSTEMS**—Evaluate where hazardous conditions may occur in the water systems and determine where control measures can be applied.
- CONTROL MEASURES**—Determine locations where control measures must be applied and maintained in order to stay within established control limits.
- MONITORING/CORRECTIVE ACTIONS**—Establish procedures for monitoring whether control measures are operating within established limits and, if not, take corrective actions.
- CONFIRMATION**—Establish procedures to confirm that
 - the Program is being implemented as designed (verification), and
 - the Program effectively controls the hazardous conditions throughout the building water systems (validation).
- DOCUMENTATION**—Establish documentation and communication procedures for all activities of the Program.

Describe the building



CDC website: Every building is different (depending on factors such as the structure, age, location, occupants of the building, or surrounding conditions), so each one needs a tailored program.

2. Describe the building water systems using flow diagrams and a written description: Include details like where the building connects to the municipal water supply, how water is distributed, and where hot tubs, water heaters or boilers, and cooling towers are located.

Building Water Survey(s)



Survey your building (or property) to determine if you need a water management program to reduce the risk of *Legionella* growth and spread.

If you answer **YES to any of questions 1 through 4, you should have a water management program for *that building's* hot and cold water distribution system.**

Healthcare Facilities

- Yes ___ No ___ 1. Is your building a healthcare facility where patients stay overnight or does your building house or treat people who have chronic and acute medical problems[†] or weakened immune systems?
- Yes ___ No ___ 2. Does your building primarily house people older than 65 years (like a retirement home or assisted-living facility)?
- Yes ___ No ___ 3. Does your building have a centralized hot water system (like a hotel or high-rise apartment complex)?
- Yes ___ No ___ 4. Does your building have more than 10 stories (including basement levels)?

Devices in buildings that can spread contaminated water droplets should have a water management program even if the building itself does not. If you answer **NO to all of questions 1 through 4 but **YES** to any of questions 5 through 8, you should have a water management program for *that device*.**

- Yes ___ No ___ 5. Does your building have a cooling tower*?
- Yes ___ No ___ 6. Does your building have a hot tub (also known as a spa) that is not drained between each use?
- Yes ___ No ___ 7. Does your building have a decorative fountain?
- Yes ___ No ___ 8. Does your building have a centrally-installed mister, atomizer, air washer, or humidifier?

www.cdc.gov/legionella/WMPtoolkit

Describe the building



CDC Toolkit / 188: Building Questions 1-4

- 1. Yes? / No?** Is your building a healthcare facility where patients stay overnight or does your building house or treat people who have chronic and acute medical problems or weakened immune systems?
- 2. Yes? / No?** Does your building primarily house people older than 65 years (retirement home, assisted-living)?
- 3. Yes? / No?** Does your building have a centralized hot-water system (hotel or high-rise apartment complex)?
- 4. Yes? / No?** Does your building have more than ten stories (including subgrade levels)?

Describe the building



CDC Toolkit / 188: Building Questions 5-8

5. Yes? / No? Does your building have a cooling tower?

6. Yes? / No? Does your building have a hot tub (also known as a spa) that is not drained between each use?

7. Yes? / No? Does your building have a decorative fountain?

8. Yes? / No? Does your building have a centrally installed mister, atomizer, air washer, or humidifier?

Describe the building



Bottom Line for ASHRAE Section 5.1 →

Implement a WMP for the following building water systems:

- Cooling Towers
- Evaporative condensers
- Whirlpool spas
- Ornamental fountains
- Misters, air washers, atomizers, humidifiers
- Other devices that aerosolize and release fine water droplets



Describe the building



Bottom Line for ASHRAE Section 5.2 →

Implement a WMP for premise plumbing systems if a building is characterized with any one of the following:

- Multiple housing units with a **centralized hot water** system
- **>Ten stories** (include subgrade)
- Housing designated for **people over 65 years** of age
- Patients staying **more than 24 hours**
- An area housing or treating people with certain **medical risk factors...**



Describe the building

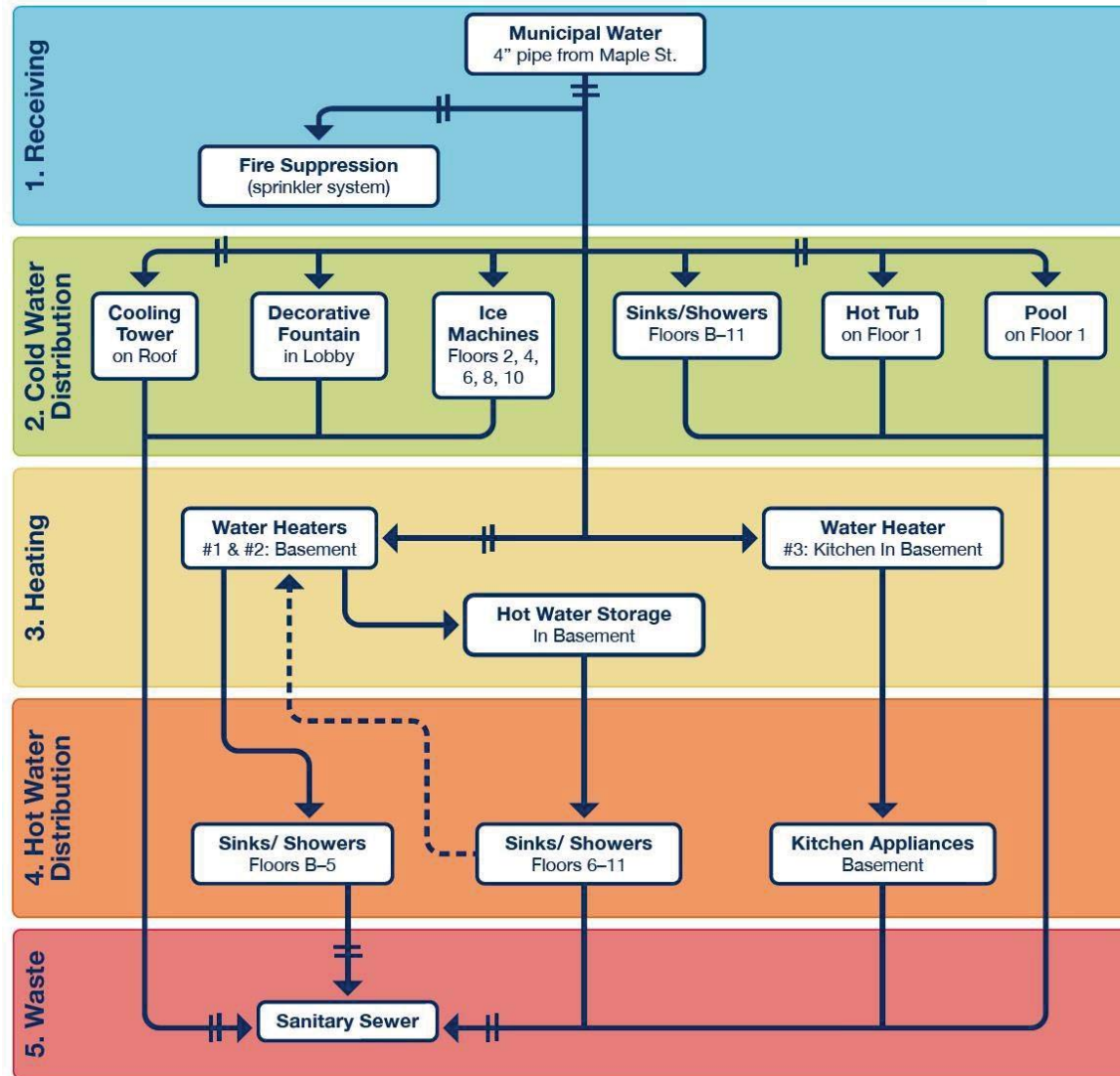


Process Flow Diagrams

CDC 188 Toolkit

Legend:

- Backflow Preventer
- Return Flow
- Water Process



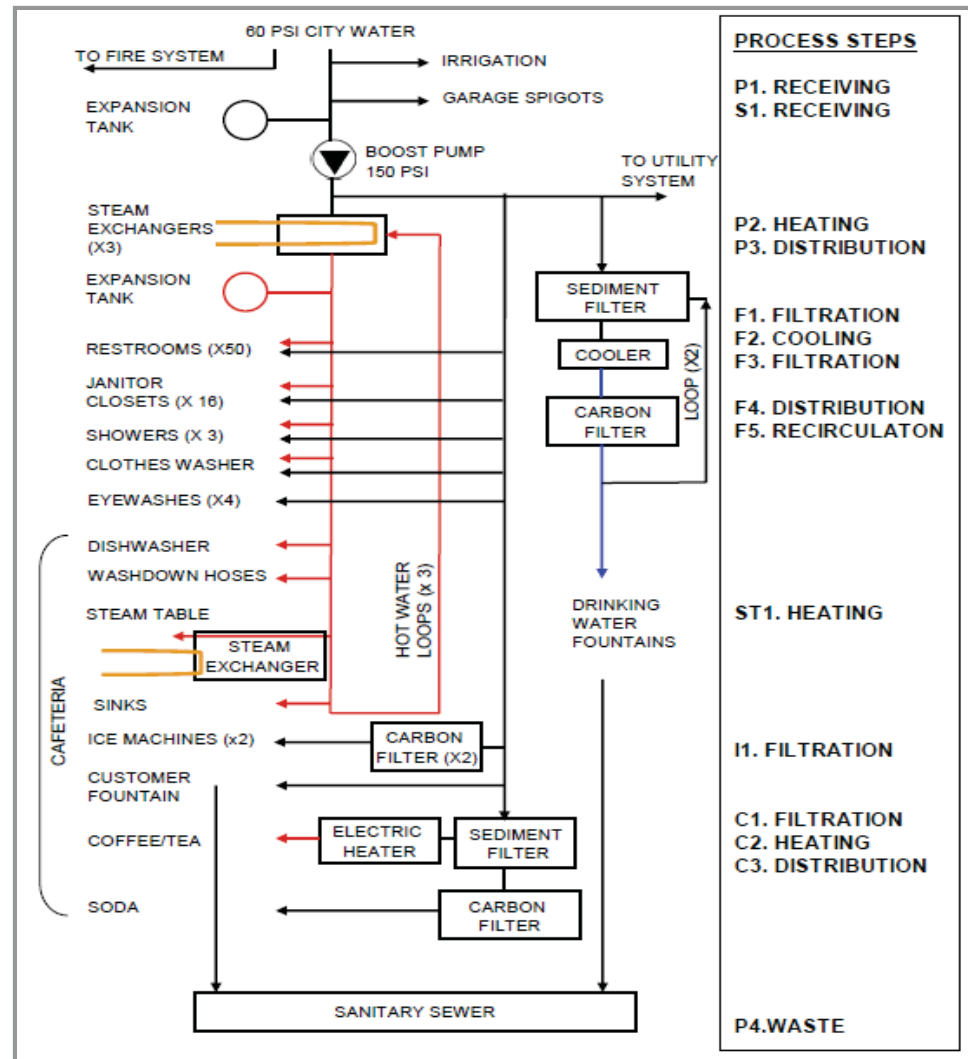
Describe the building: Process flow diagrams



(Example)
Process Flow Diagram
Potable (Domestic)
Water System

Process Steps Key:
(name and number)

- P** = primary potable
- S** = fire suppression
- F** = drinking fountains
- ST** = steam table
- I** = ice machine
- C** = cafeteria service line



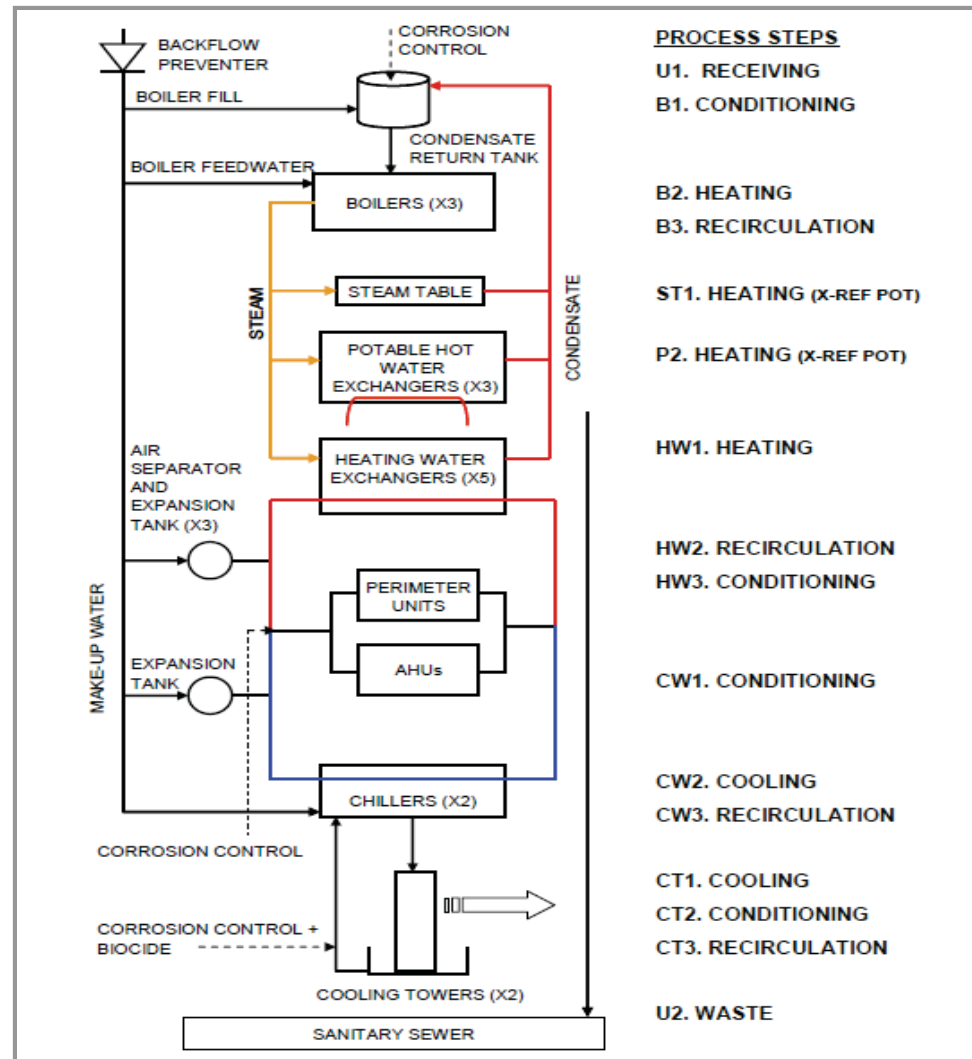
Describe the building: Process flow diagrams



(Example)
Process Flow Diagram
Nonpotable (Utility)
Water System

Process Steps Key:
(name and number)

- U** = utility
- B** = boiler
- ST** = steam table
- P** = primary potable
- HW** = hot water
- CW** = chilled water
- CT** = cooling tower
- (X-Ref Pot)** = cross/ref potable water systems



Describe the building



Summary:

- Carefully considering your building's risk factors is the first step towards managing water safety!
- The building potable & non-potable water systems must be described using written and process flow diagrams
- Flow diagrams should be sufficient in detail to enable the identification, analysis and management of the risk of legionellosis throughout the building's water systems.
- Highlight how water is received and processed in the building and delivered to end point uses
- Document, Document & Document everything!



Identify Areas of Risk in a Healthcare Facility Setting



Bill Pearson

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Identify Areas of Risk

WATER SAFETY (RISK) MANAGEMENT STEPS



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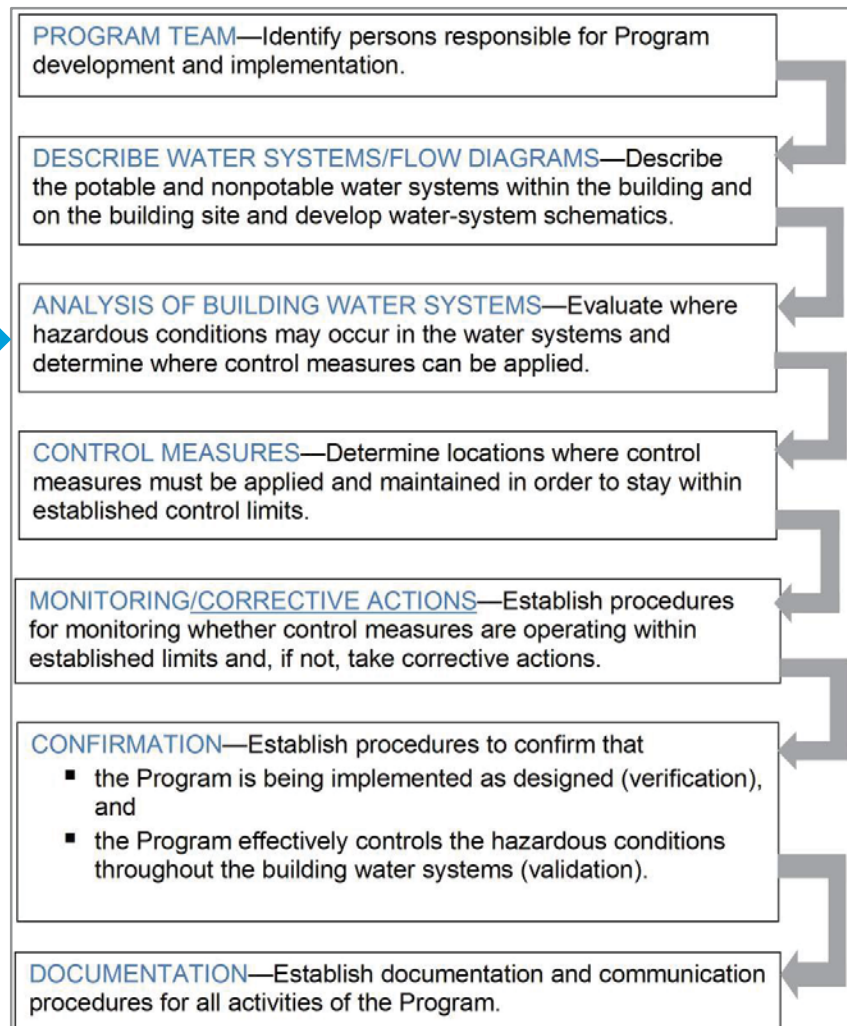
RESOURCES & TOOLS

Identifying areas of risk



ASHRAE 188 WMP Core Elements:

3. Access Risks



Identifying areas of risk



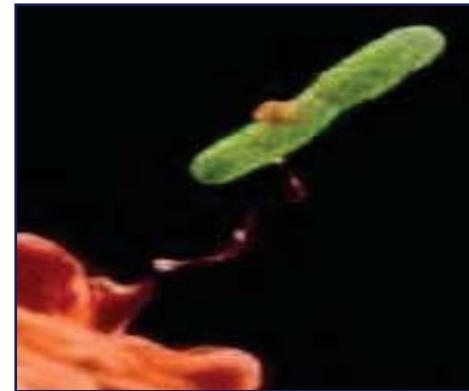
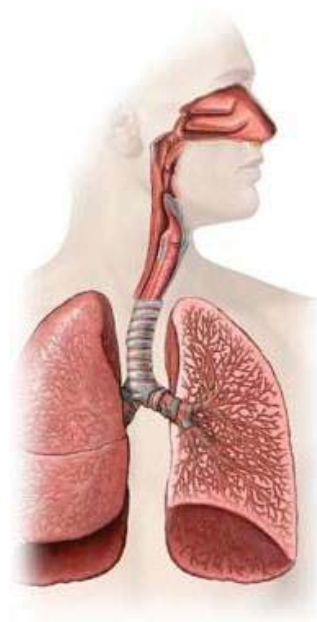
CDC website: Every building is different (depending on factors such as the structure, age, location, occupants of the building, or surrounding conditions), so each one needs a tailored program.

3. Identify areas where *Legionella* could grow and spread: Identify where potentially hazardous conditions could occur in your building water systems, such as areas where water temperature could promote *Legionella* growth or where water flow might be low.

Identifying areas of risk



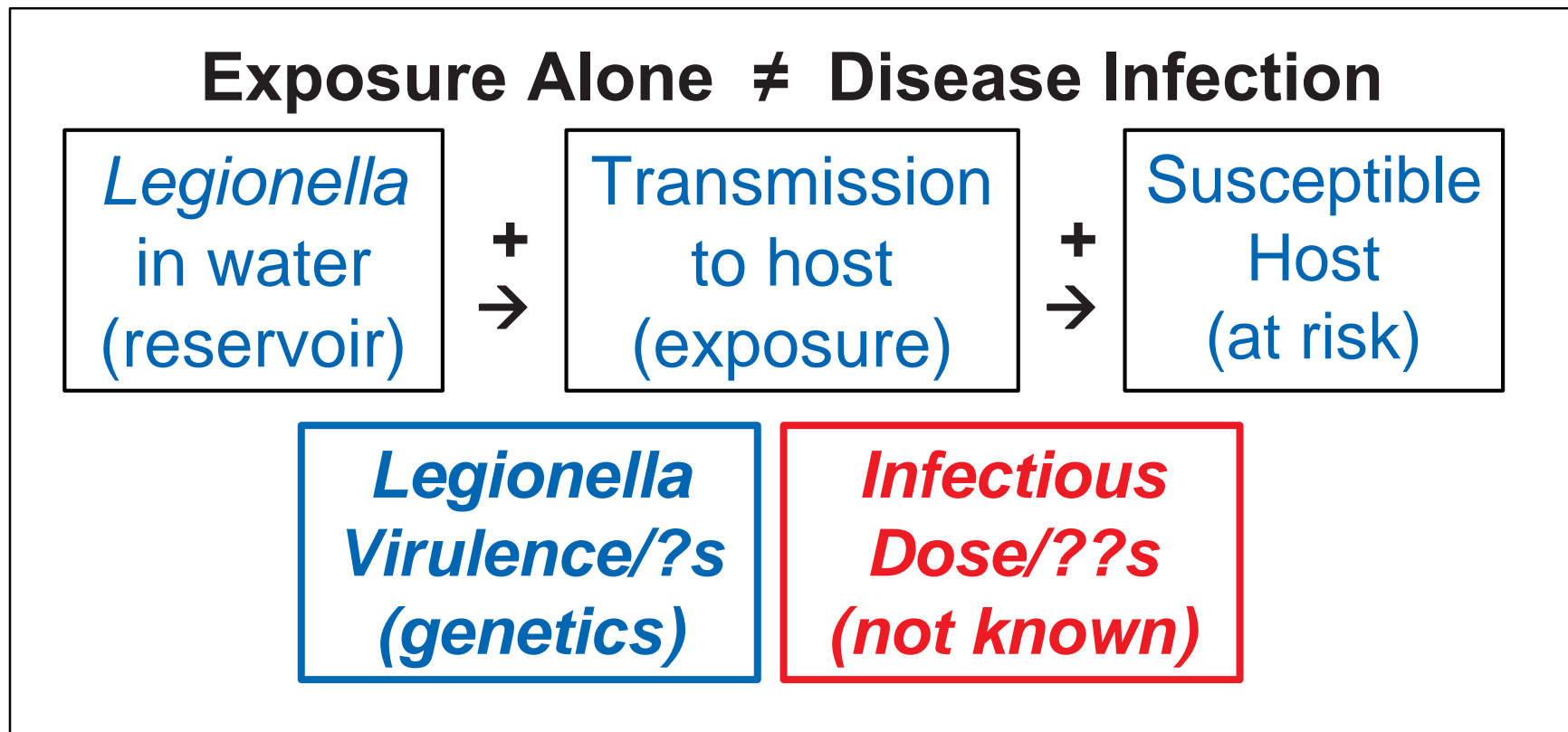
Healthcare Facilities must be LB Conscious!



Identifying areas of risk



Risk of Acquiring Legionellosis





Identifying areas of risk

At-Risk / Susceptible Hosts:

- Immune suppressed: transplants, cancer, cardiac, diabetes, steroid/drug therapy
- Sick / in poor health
- Elderly / infirm
- Heavy smokers, lung/COPD diseases

However, approximately 25% (one in four) cases of Legionnaires' disease occur in otherwise healthy individuals

Weakened Immune Systems

Identifying areas of risk



Aerosol (Mist) Producing Devices ...

- Faucets and shower heads
- Spas and whirlpool tubs
- Humidifiers
- Decorative fountains
- Sprinklers
- Cooling towers
- Evaporative condensers
- Medical/dental equipment
and others



Identifying areas of risk



Who Would Think—A Grocery Store?



- An ultrasonic mist maker device was operating over one section of the produce display ...
- No one at the grocery store was familiar with the operation or maintenance of the device ...
- High levels of *Legionella* (**Lp1**) were recovered from the device: **34 cases/2 deaths! (Bogalusa, LA Winn-Dixie store / 1990)**

Identifying areas of risk



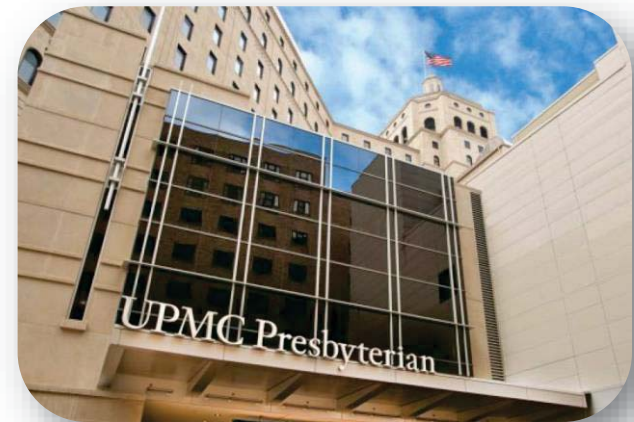
Who Would Think – An Ice Machine?!

Where?

can *Legionella* grow:

- Hot and cold water storage tanks
- Water heaters
- Water-hammer arrestors
- Expansion tanks
- Water filters
- Electronic faucets
- Aerators
- Faucet flow restrictors
- Shower heads and hoses
- Nonsteam aerosol-generating humidifiers
- Infrequently used equipment, including eyewash stations
- **Ice machines**

- Aspiration of *ice chips* contaminated with *Legionella*
- 20% of Ice Machines had ***Lp1***
- 3 Cases / 1 Death (2013)



Identifying areas of risk



Water Birth & Legionnaires' Disease ☹️

- **Case 1:** Home delivery in tub filled with tap water
- **Case 2:** Home delivery in a rented hot tub filled with tap water. **Tub at 98°F for the week prior to delivery**



Morbidity and Mortality Weekly Report
June 9, 2017

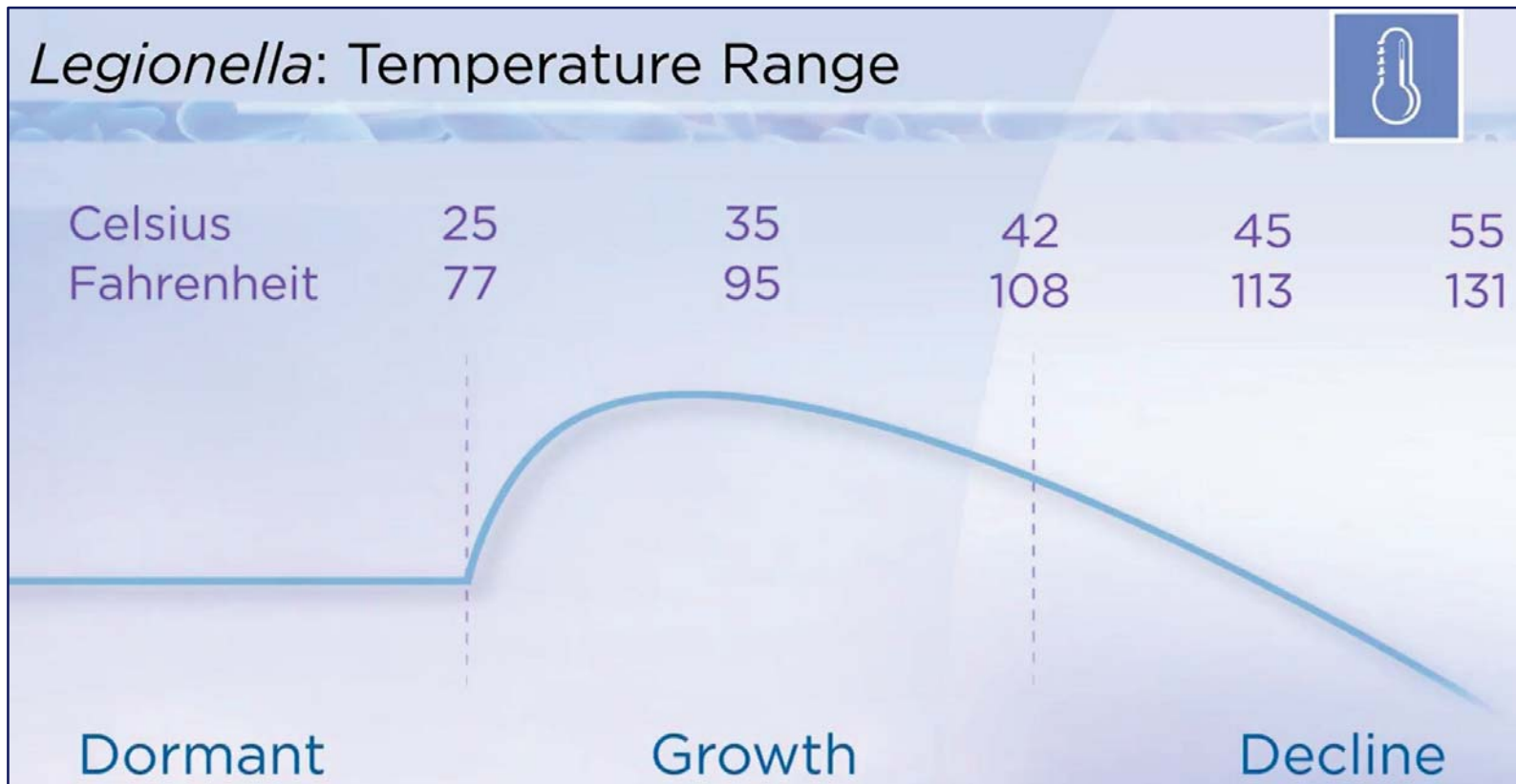
Two Cases of Legionnaires' Disease in Newborns After Water Births — Arizona, 2016

Geoffrey Granseth, MPH^{1,2}; Rachana Bhattarai, MS¹;
Tammy Sylvester, MSN³; Siru Prasai, MD³; Eugene Livar, MD¹

Identifying areas of risk



CDC: Toolkit for ASHRAE Standard 188



Identifying areas of risk



Potable Water systems in large buildings and facilities, especially in healthcare settings, with complex hot water systems are the most important source of Legionella transmission.

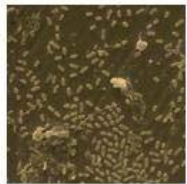
Identifying areas of risk



“... Biofilm is the Root of the Problem ...”



Legionellosis is the most significant waterborne disease in the US, and biofilm is the root of the problem, NSF says



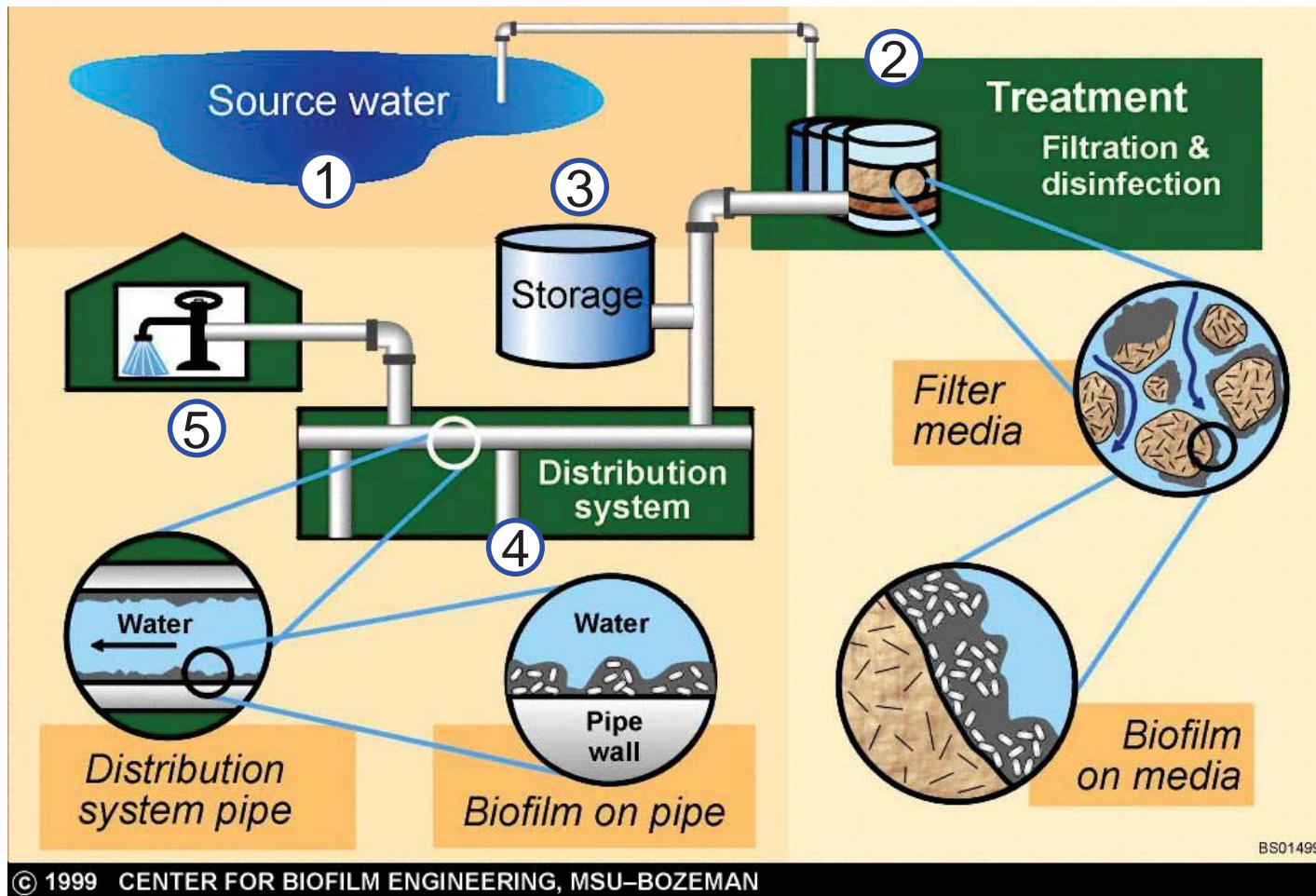
The National Science Foundation (NSF) indicates biofilm as the root of Legionellosis, that accounts for thousands of hospital admissions and many deaths in the U.S. only, and the Centers for Disease Control and Prevention (CDC) confirm that biofilm protects Legionella from disinfectant, provides food and shelter to germs. [Read more.](#)



Identifying areas of risk



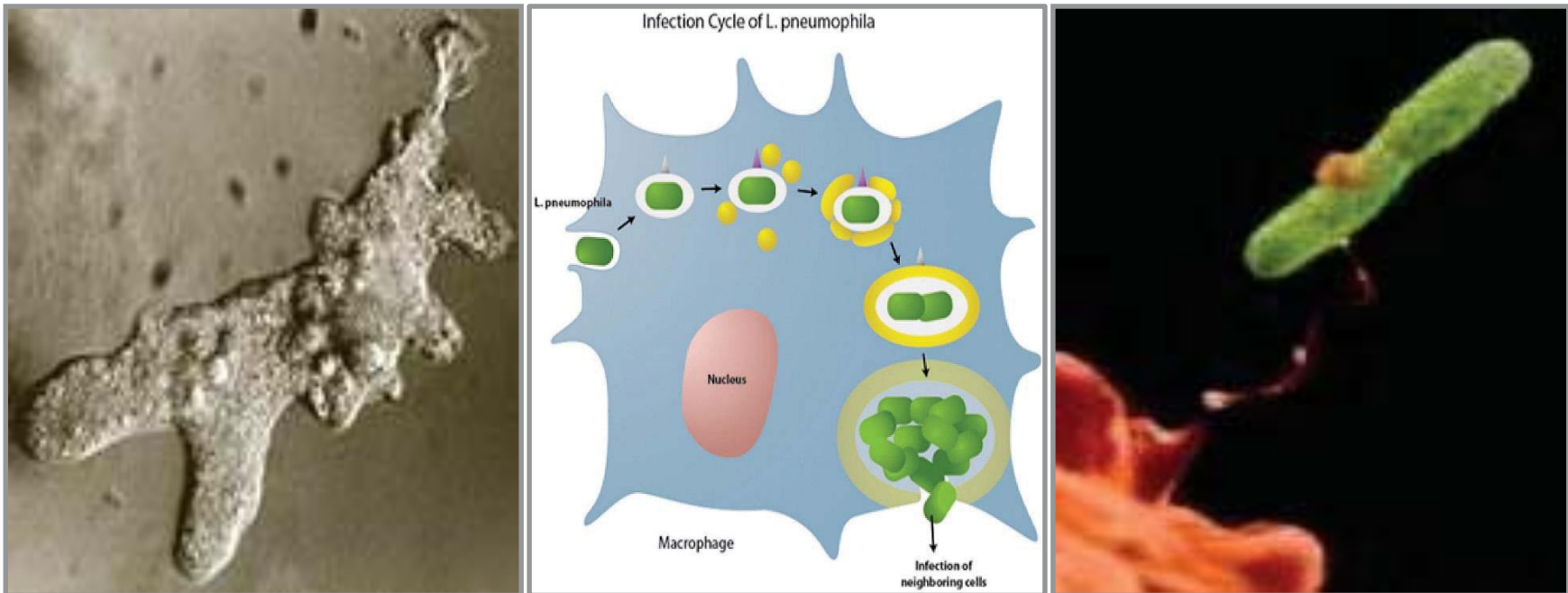
Biofilm is in Our Water Systems!



Identifying areas of risk



Legionella: 'Live' within Protozoa!

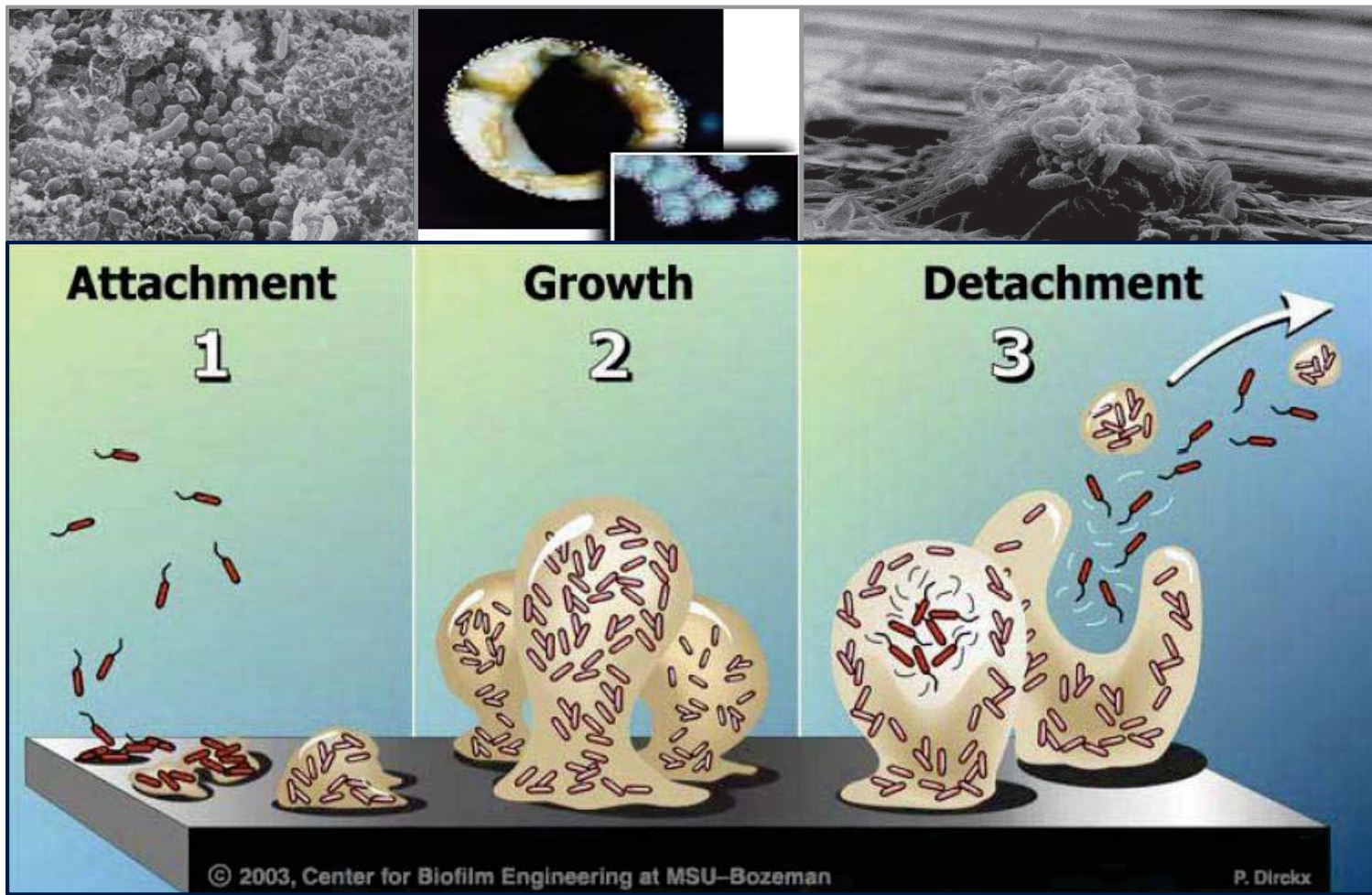


(Intracellular Parasites)

Identifying areas of risk



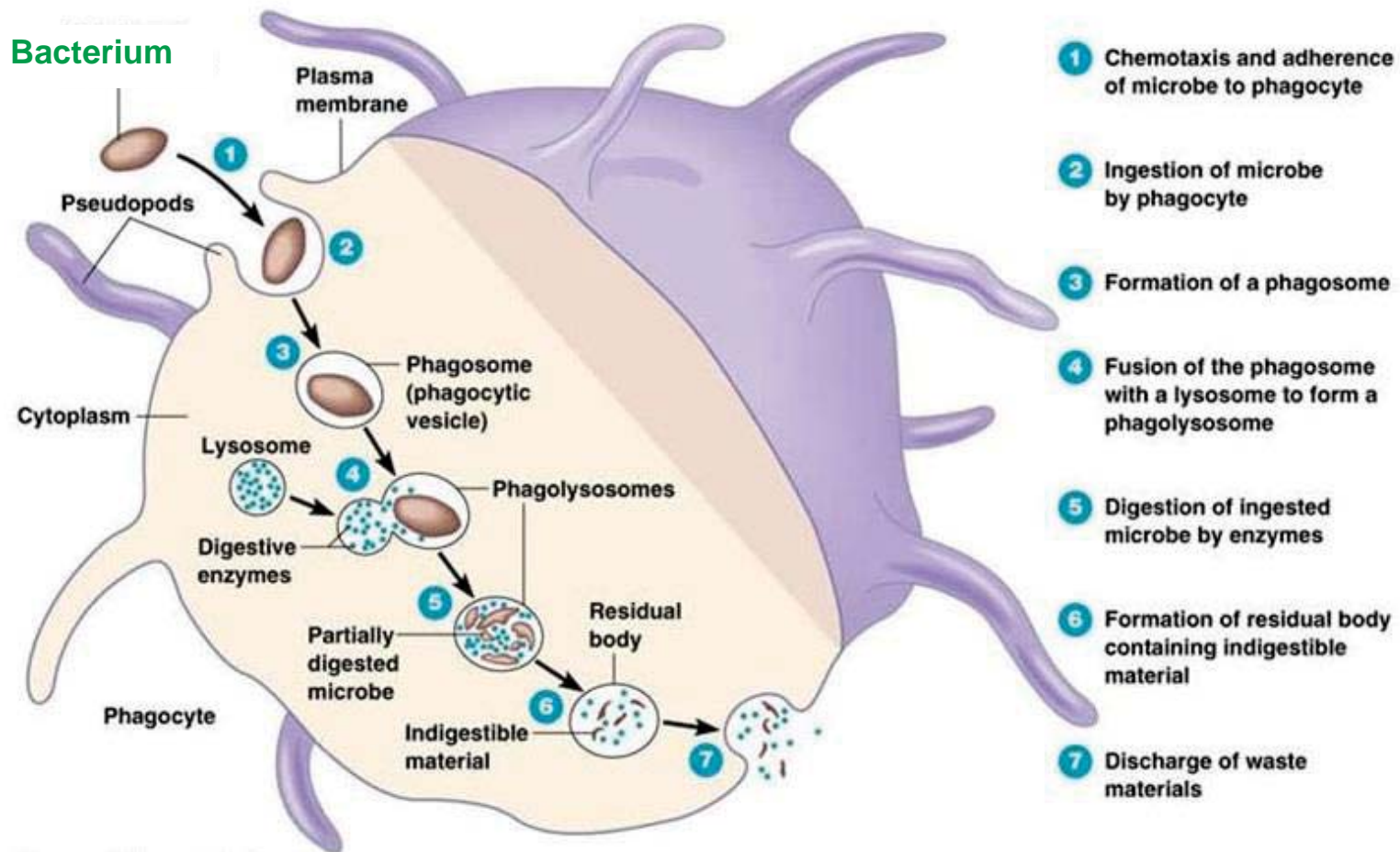
Legionella: Thrive within Biofilm



Identifying areas of risk



Phagocytosis: How Protozoa 'Feed' on Bacteria



Protozoan "Feeding" on a Bacterium

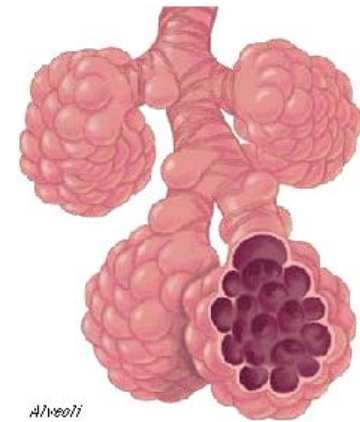


Identifying areas of risk



Legionella → Interesting Pathogenesis

1. Enter the host, penetrating deep into the alveolar regions of the lungs ...
2. Macrophages come to **ingest** and destroy the invading bacteria;



However, *Legionella* **survive** & multiply within the macrophage, as they do in nature – living within host Protozoa (Amoebae) ...



Identifying areas of risk



Legionella → Interesting Pathogenesis

3. The *Legionella* ultimately lyse (burst open) the macrophage cell, killing it, while releasing **many** new *Legionella* and worsen the infection →



Identifying areas of risk



Summary:

- Identifying areas of risk is critical to establishing control measures and strategies to help prevent disease
- Use the process flow diagrams to evaluate where hazardous conditions may occur in the building systems
- Determine where control measures can be applied to control potentially hazardous system conditions
- Consider the vulnerability of occupants and include provisions to respond to water service disruptions
- Document, Document and Document everything!