

Legionella 101



Respiratory Diseases Branch
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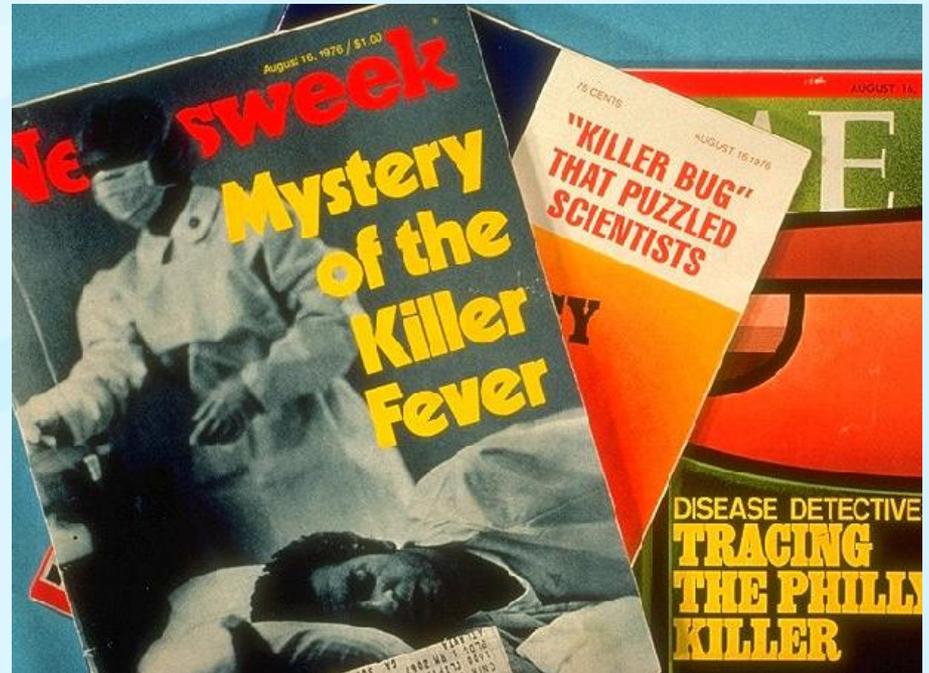
Outline

- ❑ **Introduction to *Legionella* and legionellosis**
 - History
 - The bacterium
 - Transmission
 - The diseases
 - Epidemiology
- ❑ **Surveillance**
 - Passive surveillance
 - Active surveillance pilot

INTRODUCTION TO *LEGIONELLA* AND LEGIONELLOSIS

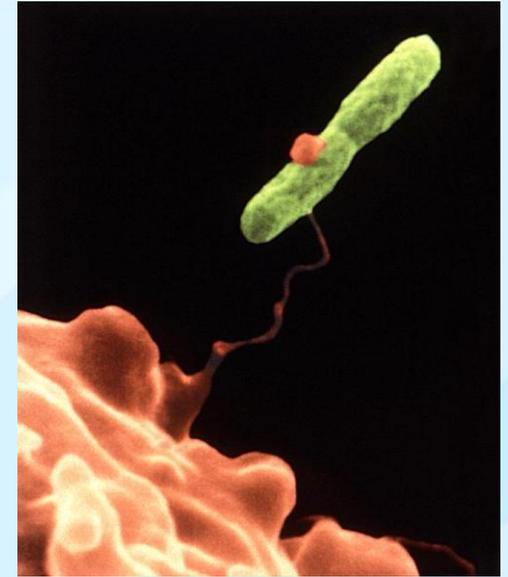
History of Legionellosis

- ❑ First described following 1976 outbreak at American Legion convention in Philadelphia
- ❑ 221 cases of Legionnaires' disease with 34 deaths
- ❑ Cooling system suspected to be the source

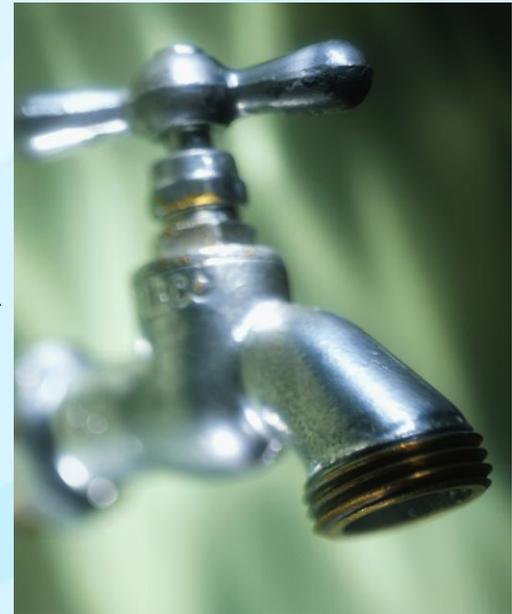


Legionella

- ❑ Atypical gram-negative bacillus
- ❑ Intracellular parasite of free-living protozoa primarily found in freshwater environments
- ❑ There are 52 species and 70 serogroups of *Legionella*
- ❑ 22 species associated with human disease
- ❑ *Legionella pneumophila* accounts for 80-90% of all cases
- ❑ Molecular subtyping of *L. pneumophila*
 - Monoclonal antibody typing (MAb typing)
 - Sequence-based typing (SBT)



Legionella is found naturally in fresh water



BUT natural environments (e.g., lakes, rivers) do NOT have sufficient quantities of *Legionella* to cause transmission

Amplification

- ❑ **Temperature 25°C - 42°C (77°F-108°F)**
- ❑ **Stagnation**
- ❑ **Scale and sediments**
- ❑ **Biofilms**
- ❑ **Presence of amoebae**
- ❑ **Natural rubbers, wood and some plastics support growth, copper inhibits growth**

Temperature Range for *Legionella*

Celsius 25 35 42 45 55

Fahrenheit 77 95 108 113 131



Transmission via Aerosolized Water



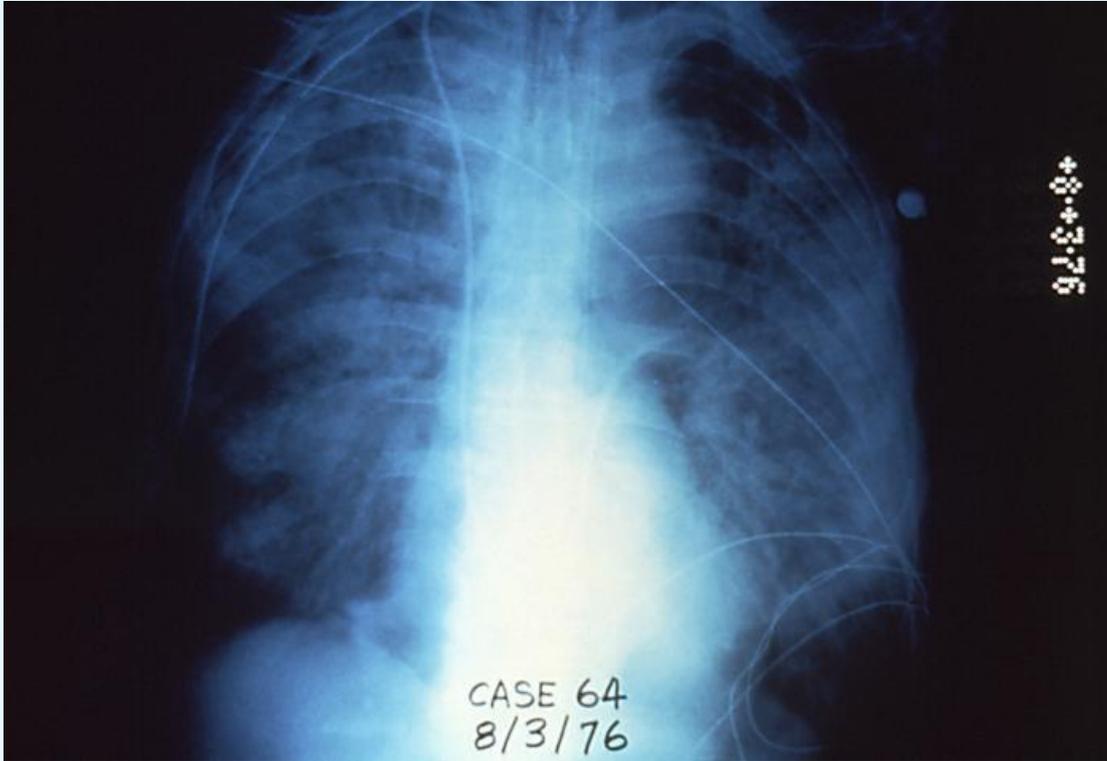
Legionellosis (Legionnaires' disease and Pontiac fever)

	LD	Pontiac fever
Clinical Features	Pneumonia	Flu-like illness
Hospitalization	Common	Uncommon
Treatment	Antibiotics	None
Case Fatality Rate	5-40%	0%
Attack Rate	<5%	>85%
High Risk Groups	Age 50+, smokers, immunosuppressed diabetes, COPD	None
Incubation Period	2-10 days	1-3 days
Isolation of Organism	Possible	Virtually never
Pathogenesis	Replication of organism	Inflammatory response to endotoxin

Clinical Features of LD

- ❑ Incubation period is 2-10 days (most often 5-6 days)**
- ❑ Difficult to distinguish from other causes of pneumonia**
- ❑ Initial symptoms include anorexia, malaise, myalgia, headache**
- ❑ Within 24 hrs, rapidly rising fever 102-105°F**
- ❑ Nonproductive cough, abdominal pain, nausea, vomiting, and diarrhea are common**
- ❑ Chest radiograph: patchy infiltrates or focal areas of consolidation which may progress to bilateral involvement and respiratory failure**

Clinical Features of LD



Anteroposterior CXR

Bilateral pulmonary infiltrates in a 1976 outbreak victim

CDC 1976

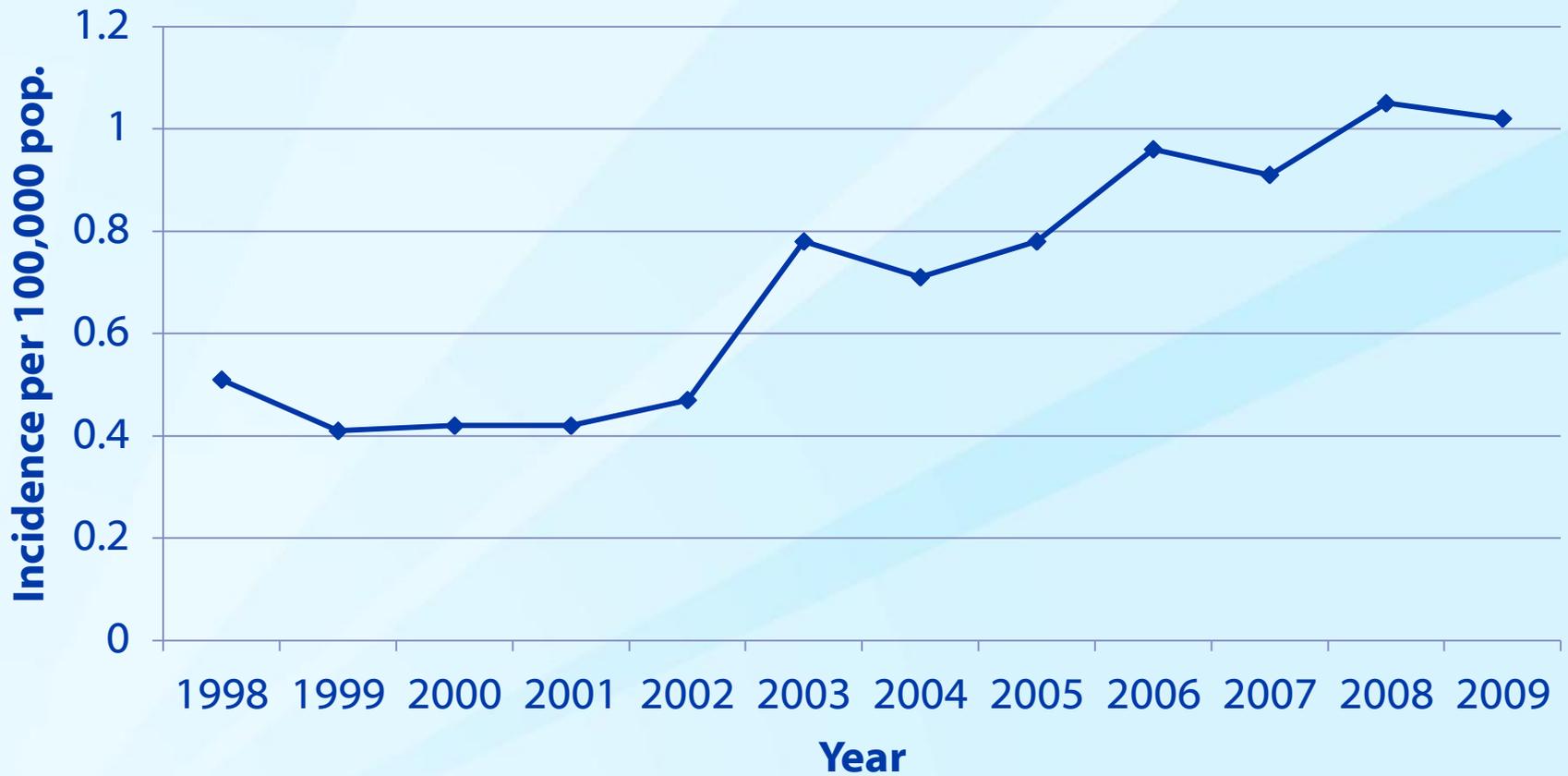
Diagnostic Testing

Test	Advantages	Disadvantages
Culture	<ul style="list-style-type: none">• Clinical & environmental isolates can be compared• Detects all species & serogroups• 100% specific	<ul style="list-style-type: none">• Technically difficult• Slow (>5 days to grow)• Sensitivity highly dependent on technical skill
Urine antigen	<ul style="list-style-type: none">• 60-80% sensitive, >99% specific (for Lp1 only)• Rapid (same day)	<ul style="list-style-type: none">• Can only detect <i>L. pneumophila</i> serogroup 1 (Lp1) antigen• Limited utility when compared to environmental isolates
Serology	<ul style="list-style-type: none">• Unaffected by antibiotic treatment• 70-80% sensitive, >90% specific	<ul style="list-style-type: none">• MUST have paired sera• 5-10% of population has titer $\geq 1:256$
DFA	<ul style="list-style-type: none">• Can be performed on pathologic specimens• 95% specific	<ul style="list-style-type: none">• 25-75% sensitive

Disease Burden

- ❑ Number one cause of atypical community-acquired pneumonia among patients who are admitted to ICU
- ❑ 8,000-18,000 hospitalizations in the U.S. each year
- ❑ Inpatient cost estimates total \$92-582 million per year
- ❑ During 2005-2006, 50% of all drinking water outbreaks nationwide were caused by *Legionella*
- ❑ 10-20% are outbreak-associated
- ❑ 20% are travel-associated
- ❑ Incidence is increasing

National Incidence of Legionellosis, 1998-2009*



*2009 Official Provisional Data

Key RDB Activities

- ❑ **Surveillance**
- ❑ **Training and Education**
- ❑ **Outbreak Coordination and Response**
- ❑ **Clinical and Environmental Laboratory Diagnostics**
- ❑ **Development and Revision of Guidelines**
- ❑ **Research**



SURVEILLANCE FOR LEGIONELLOSIS

Public Health Surveillance

- ❑ Legionellosis is one of ~67 nationally notifiable infectious diseases reported to the National Notifiable Diseases Surveillance System (NNDSS)**
- ❑ NNDSS collects basic count data, sex, and age**
- ❑ RDB maintains a supplemental surveillance system, which collects travel history, hospitalizations/LTCF exposures, disease (LD vs. PF), method of lab confirmation, and case status**
- ❑ Additionally, outbreaks are reported through the National Outbreak Reporting System (NORS) to the Waterborne Disease Prevention Branch (WBDPB)**
- ❑ National case definition is defined by CDC & CSTE**

One Year Active Surveillance Pilot

- ❑ Volunteer EIP/ABCs sites will pilot lab-based active surveillance for legionellosis in 2010
 - ❑ Other proposed activities:
 - ❑ Lab survey
 - ❑ One-time chart audit of hospital discharges with a legionellosis diagnosis
 - ❑ Retrospective review of cases to improve understanding of disease trends and use of diagnostics



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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.