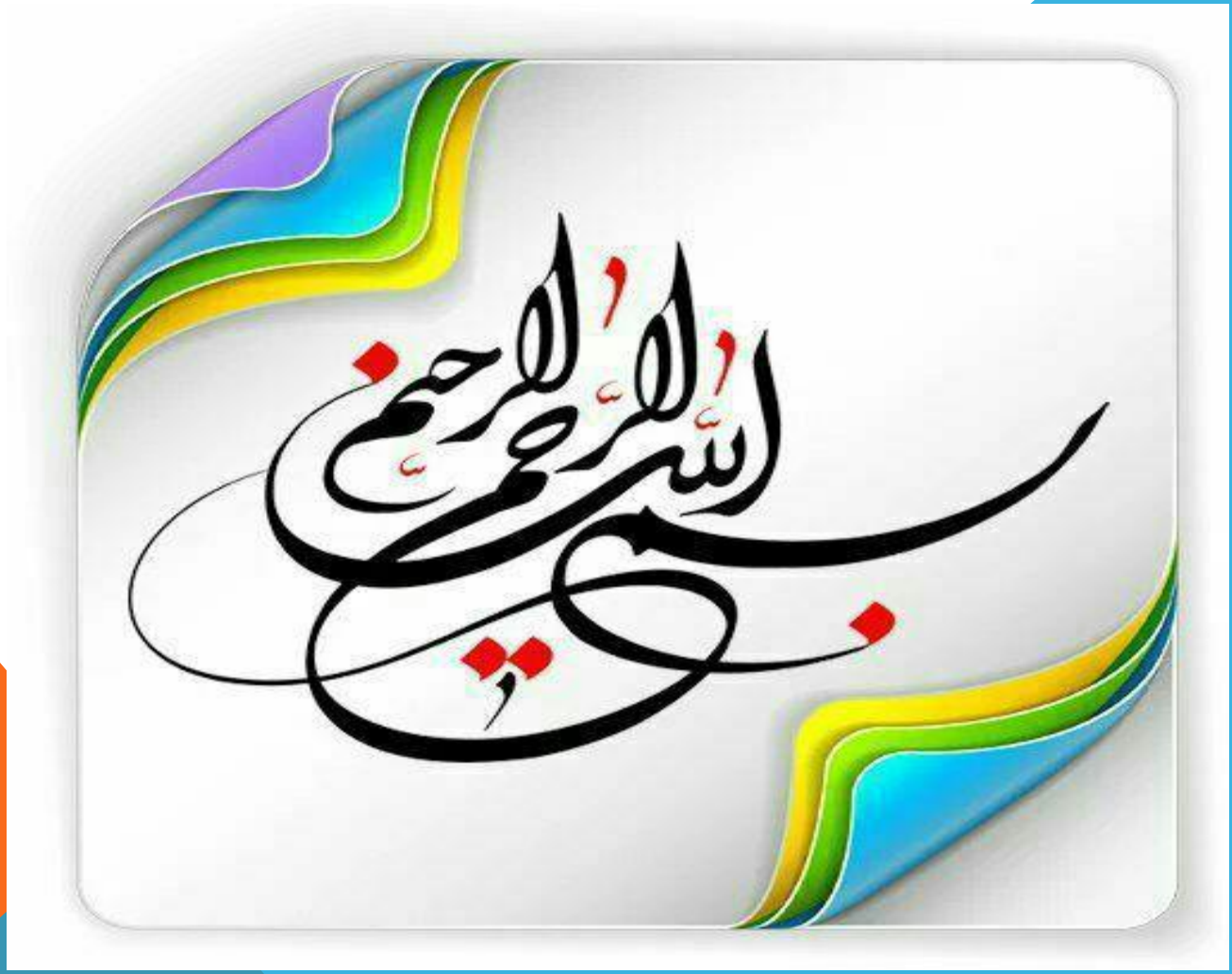

بسم الله الرحمن الرحيم

Atypical Pneumonia

What is atypical pneumonia?

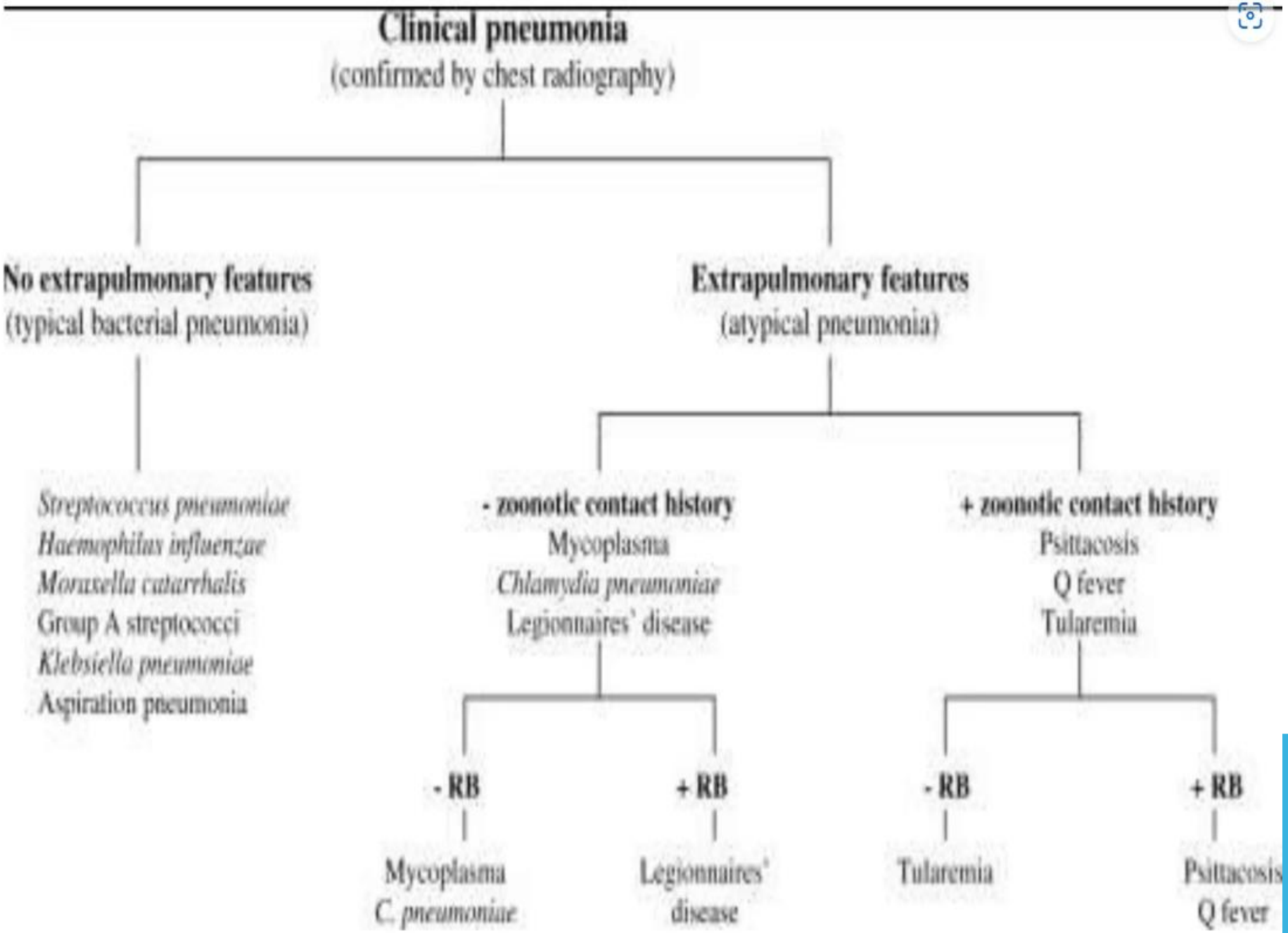
- quite common.
- 2 million cases of mycoplasma pneumonia occur in the US each year.
- 8,000-18,000 patients are hospitalized for Legionnaires' disease in the US each year.

WHAT IS ATYPICAL PNEUMONIA?

- bacterial infection of lower respiratory tract caused by Mycoplasma pneumoniae, Chlamydia pneumoniae, Chlamydia psittaci, and Legionella pneumophila.
- The types of bacteria that cause it tend to create less severe symptoms than those in typical pneumonia.
- Cases of atypical pneumonia do not usually require hospitalization, and a person with it is unlikely to be significantly ill. This is why it is often called walking pneumonia.

Typical vs atypical pneumonia

Typical pneumonia	Atypical pneumonia
Causative organism are typical	Causative organism are atypical bacteria, viruses, fungus, parasites, non infective caused like chemical, irradiation
Immuno-competant	Immuno-suppressed
Clinical and laboratory findings limited to the lungs	Systemic infectious disease with a pulmonary component like GI or CNS
Unilateral involvement	Bilateral involvement
follow alveolar pattern	follow interstial pattern
Neutrophilic infiltrates	Lymphocytic infiltrates
Chest x-ray will show lobar or segmental homogenous opacity in over 80% of typical bacterial pneumonia.	Chest x-ray will show diffuse patchy or GGO >>> lobar or segmental homogenous opacity .
Classically response to BL/BL-BI combination therapy	These do not have cell wall or are intracellular. Hence, do not responds to BL/BL-BI combination therapy
	Public health concerns , can cause HAP Outbreak


Clinical pneumonia
(confirmed by chest radiography)
No extrapulmonary features
(typical bacterial pneumonia)
Extrapulmonary features
(atypical pneumonia)
Streptococcus pneumoniae
Haemophilus influenzae
Moraxella catarrhalis
Group A streptococci
Klebsiella pneumoniae
Aspiration pneumonia
- zoonotic contact history
Mycoplasma
Chlamydia pneumoniae
Legionnaires' disease
+ zoonotic contact history
Psittacosis
Q fever
Tularemia
- RB
+ RB
- RB
+ RB
Mycoplasma
C. pneumoniae
Legionnaires' disease
Tularemia
Psittacosis
Q fever

Type	Pathogen	Radiographic Findings: Lobar Consolidation	Radiographic Findings: Reticulonodular Opacities	Radiographic Findings: Peribronchial Cuffing	Radiographic Findings: Pleural Effusion	Notes
Nonzoonotic	*M pneumoniae*	+	+++	+++	+	Possible to have effusions or adenopathy
	L pneumoniae	+++	–	–	+++	Unilateral pleural effusions are common
	C pneumoniae	++	+	–	+	Typically unilobar involvement, with patchy consolidation in lower lobes
Zoonotic	*F tularensis*	++	++	–	++	Variable appearance; can have single consolidations that resemble lung cancer
	C psittaci	++	+	–	–	Favors lower lobes
	C burnetii	++	++	–	–	Variable appearance; conflicting data on upper versus lower lobe predominance

Type	Pathogen	CT Findings: Ground-Glass Opacity and Consolidation	CT Findings: Nodules, Micronodules, and Tree-in-Bud Opacities	CT Findings: Interlobular Septal Thickening	CT Findings: Bronchial and/or Bronchiolar Wall Thickening	Notes
Nonzoonotic	*M pneumoniae*	+++	+++	–	+++	Perihilar ground-glass opacities, diffuse centrilobular micronodules, bronchial wall thickening
	L pneumoniae	+++	–	–	–	Can progress from single lower lobe consolidation to multifocal asymmetric opacities; perihilar distribution with hilar adenopathy
	C pneumoniae	+++	–	+	–	Acinar pattern of ground-glass opacities; possible airway dilatation; lymphadenopathy is uncommon
Zoonotic	*F tularensis*	++	++	–	–	Patchy lobar or multilobar opacities; can have pleural effusions and prominent hilar and mediastinal lymphadenopathy
	C psittaci	++	–	–	–	Can range from normal-appearing to patchy or lobar consolidation
	C burnetii	++	++	–	–	Areas of nodular consolidation have been reported to demonstrate a ground-glass halo sign

What is atypical pneumonia?

- People with atypical pneumonia will also have certain symptoms that others with typical pneumonia will often not have. These might include a prominent headache, a low-grade fever, an earache, and a sore throat.
- Symptoms of atypical pneumonia tend to be milder and more persistent than those of typical pneumonia, which appear suddenly, and cause a more serious illness.
- Atypical pneumonia requires different antibiotics than typical pneumonia, which is commonly caused by the bacteria *Streptococcus pneumonia*.

Chlamydia pneumoniae Infection

- one cause of community-acquired pneumonia
- The bacteria cause illness by damaging the lining of the respiratory tract including the throat, windpipe, and lungs.
- Some people may become infected and have mild or no symptoms.
- spread by coughing or sneezing, which creates small respiratory droplets
- long incubation periods 3-4 weeks

Chlamydia pneumoniae Infection

- *C. pneumoniae* growth consists of two alternating forms: elementary and reticulate bodies.
- Elementary bodies are metabolically inactive.
- They infect the host when cells ingest the elementary bodies through the process of receptor-mediated endocytosis.
- Once inside the cell, the elementary bodies differentiate into reticulate bodies, which are metabolically active but noninfectious.
- The reticulate bodies rely on the host cell for adenosine triphosphate (ATP) synthesis.
- The reticulate bodies divide by binary fission and induce a host immune response.
- After 48 to 72 hours, the reticulate bodies reorganize themselves and condense to form new elementary bodies.
- The elementary bodies then leave the host cell and start a new infectious cycle.

Chlamydia pneumoniae Infection

- all ages can get infection
- People at increased risk include those who live or work in crowded places where outbreaks most commonly occur[8], such as:
  - Schools
  - College residence halls
  - Military barracks
  - Nursing homes
  - Hospitals
  - Prisons
- Older adults are at increased risk for severe disease

Chlamydia pneumoniae Infection Signs and Symptoms

- *chlamydia pneumoniae* infection is a mild illness that most commonly causes an upper respiratory tract infection. :
  - Runny or stuffy nose
  - Fatigue (feeling tired)
  - Low-grade fever
  - Hoarseness or loss of voice
  - Sore throat
  - Slowly worsening cough that can last for weeks or months
  - Headache
- *C. pneumoniae* can also cause lower respiratory tract infections like bronchitis and pneumonia.
- Symptoms can continue for several weeks

Chlamydia pneumoniae Infection Complications

- Encephalitis
- Myocarditis
- might contribute to chronic conditions, such as asthma, arthritis, and atherosclerosis

Chlamydia pneumoniae Infection Diagnosis

types of specimens

- NP swabs
- OP (throat) swabs
- NP aspirates
- Sputum
- Tissue
- Bronchial lavage (BAL) fluid
- Bronchial washings
- Cerebral spinal fluid (CSF)

Chlamydia pneumoniae Infection Diagnosis

1- **Molecular** real-time PCR (preferred method for the diagnosis of an acute infection

- available , high sensitivity and specificity, expensive

2- **Serology** enzyme immunoassay

- available , lacks specificity, not standardized, ,not optimal for treatment decisions

3- **Culture**

genotyping and antimicrobial susceptibilities testing, Time-consuming , low sensitivity and specificity, Positive results should be confirmed by PCR

Chlamydia pneumoniae Infection Diagnosis Imaging

- unilateral pattern of alveolar infiltrates or bronchopneumonia predominates then progress bilateral
- Findings are usually confined to a single lobe with lower lobe involvement more frequent than middle or upper lobe involvement Up to a quarter of patients may demonstrate a
- small to moderate-size pleural effusion.
- Hilar or mediastinal lymphadenopathy is an uncommon.

PATCHY CONSOLIDATION OF RT. BASAL SEGMENT OF THE LUNG

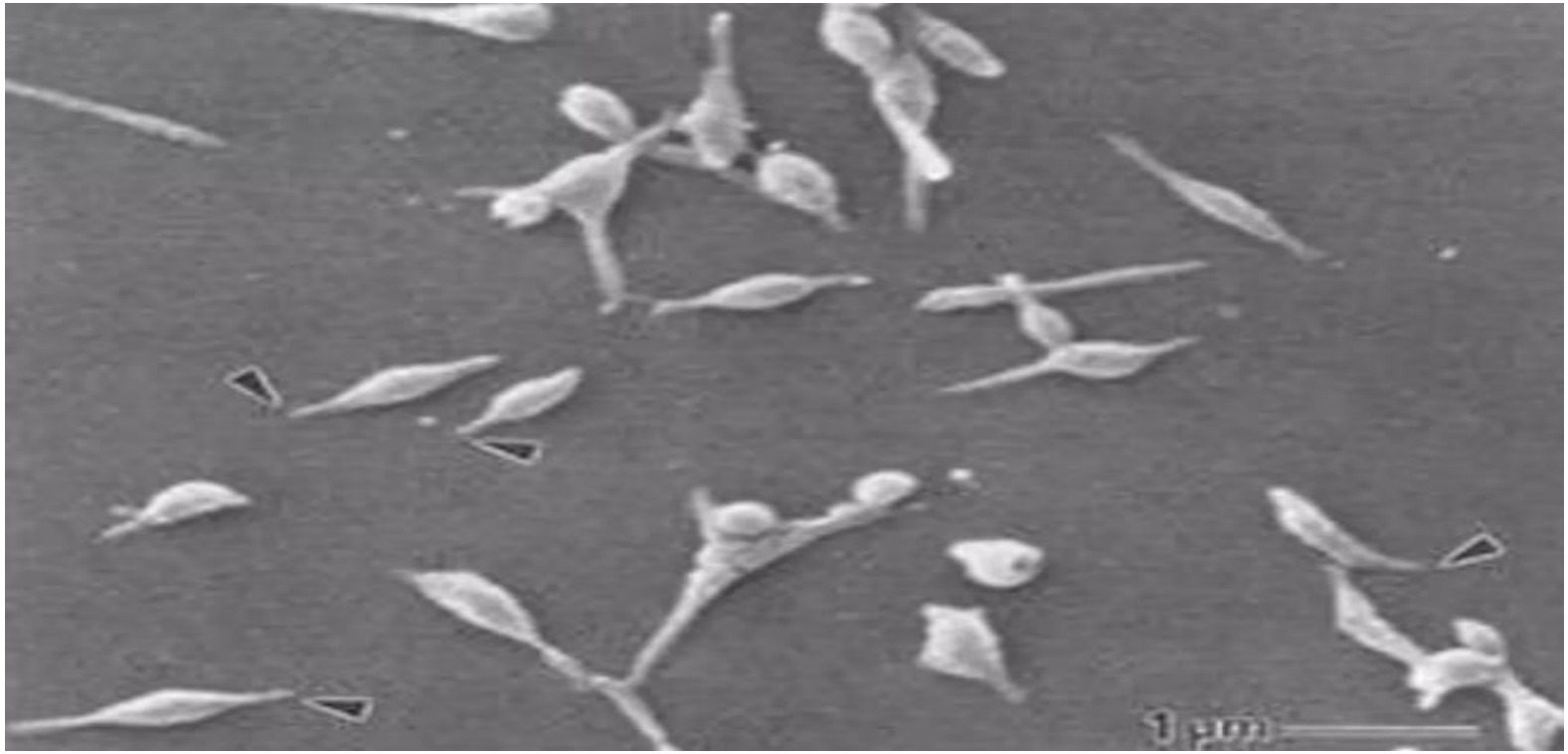
Chlamydia pneumoniae Infection Treatment

- Illness caused by *Chlamydia pneumoniae* is usually self-limiting and patients may not seek care.

Because C pneumoniae is an obligate intracellular microbe, antibiotics must achieve intracellular penetration to achieve efficacy

- Macrolides (azithromycin) — first-line therapy
- Tetracyclines (tetracycline and doxycycline)
- Fluoroquionolones

MYCOPLASMA PNEUMONIAE



MYCOPLASMA PNEUMONIAE INFECTIONS PATHOGENESIS

- spread through airborne droplets from person to person and is exclusively a human pathogen.
- primarily an extracellular pathogen that has evolved a specialized attachment organelle for close association with host cells.
- *This* attachment is critical to the bacteria's survival and ability to infect. The close association between *M. pneumoniae* and the host cells prevents the host's mucociliary clearance mechanisms from removing the bacterium.
- The bacterium attaches to and damages the respiratory epithelial cells at the base of cilia. This activates the innate immune response and produces local cytotoxic effects.

Mycoplasma pneumoniae infections Clinical Features

- *Mycoplasma pneumoniae* infections can occur in the upper or lower respiratory tract.
- The bacterium can also cause a wide array of extrapulmonary manifestations without obvious respiratory disease.
- The incubation period is generally between 1 to 4 weeks
- Infection most commonly results in:
  - Tracheobronchitis
  - Pharyngitis
  - Malaise
  - Fever
  - Cough
  - Headache

MYCOPLASMA PNEUMONIAE INFECTIONS DIAGNOSTIC METHODS

Specimen : NP, OP, sputum or sera

Molecular real-time PCR :available ,High sensitivity and specificity, Rapid, expensive, not standardized

Serology: available, low specificity

Culture genotyping and antimicrobial susceptibilities testing, 100% specificity , Time-consuming

Mycoplasma pneumonia Posteroanterior (PA) chest radiograph shows bronchial wall thickening and **mid and lower lung zone predominant heterogeneous opacities** involving both **lungs symmetrically**. There is **relative sparing of the lung apices**.

Axial chest CT image (lung window) obtained at the level of the ventricles shows **diffuse bilateral centrilobular nodules** (arrow), **peribronchovascular ground-glass opacities**, and **bronchial wall thickening**, findings commonly seen in mycoplasma pneumonia.

Mycoplasma pneumoniae infections Treatment

- All mycoplasmas lack a cell wall and, therefore, all are inherently resistant to beta-lactam antibiotics (e.g., penicillin).
  - Macrolides (e.g., azithromycin): Children and adults
  - Fluoroquinolones: Adults
  - Tetracyclines (e.g., doxycycline): Older children and adults

PSITTACOSIS

- *Chlamydia psittaci* is a type of bacteria that often infects birds, Less commonly humans
- cause a disease called psittacosis with a wide range of symptoms, including fever, headache, and a dry cough. This illness can also cause pneumonia

Psittacosis
Clinical Features

- vary widely from no evidence of infection to severe systemic disease accompanied by pneumonia.

- The predominant presentation is upper respiratory tract infection with constitutional symptoms.
  - Abrupt onset of fever and chills
  - Headache
  - Muscle aches
  - Nonproductive cough

- Patients may present with pulse-temperature dissociation (fever without increased pulse rate), splenomegaly, and rash, though less frequently.

- The incubation period is typically 5 to 14 days.
- Pneumonia is evident often on chest x-ray. Radiographic findings may include lobar or interstitial infiltrates

Psittacosis
Clinical Complications

- Severe pneumonia requiring intensive-care support
- Respiratory failure
- Endocarditis
- Myocarditis
- Hepatitis
- Arthritis
- Encephalitis
- Sepsis
- Death occurs in less than 1%

Psittacosis Treatment

- *Chlamydia psittaci* are sensitive to both macrolides and tetracyclines. However, tetracyclines are the drugs of choice, unless contraindicated as they are in children, due to reported macrolide failures.

LEGIONELLOSIS (LEGIONNAIRES' DISEASE AND PONTIAC FEVER)

- 60 different species of *Legionella*; most are considered pathogenic,
- but most disease is caused by *Legionella pneumophila*, particularly serogroup 1.
- *Legionella* is transmitted via inhalation of aerosolized water containing the bacteria.
- Legionnaires' disease is likely underdiagnosed, More than 6,000 cases were reported in US 2015.
- Legionnaires' disease is hard to distinguish from pneumonia caused by other pathogens because it presents similar clinical symptoms; however, presence of diarrhea and elevated creatinine kinase levels can be indicators

LEGIONELLOSIS
RISK FACTORS

- Age ≥50 years
- Smoking (current or historical)
- Chronic lung disease (such as emphysema or COPD)
- Immune system disorders due to disease or medication
- Systemic malignancy
- Underlying illness such as diabetes, renal failure, or hepatic failure
- Recent travel
- Exposure to hot tubs

LEGIONELLOSIS
CLINICAL FEATURES

	Legionnaires' disease	Pontiac fever
Clinical features	Fever, myalgia, and cough shortness of breath, headache, confusion, nausea, diarrhea)	A flu-like illness, often with fever, chills, headache, myalgia, fatigue, malaise; less often with symptoms such as cough or nausea
Pneumonia (clinical or radiographic)	yes	no
Pathogenesis	Replication of organism	inflammatory response to endotoxin
Incubation period	2 to 10 days	24 to 72 hours

LEGIONELLOSIS
CLINICAL FEATURES

	Legionnaires' disease	Pontiac fever
Isolation of the organism	Possible	Never demonstrated
Treatment	Antibiotics	Supportive care
percent of people who become ill, when exposed to the source of *Legionella*	Less than 5%	Greater than 90%
Outcome	Hospitalization common Case-fatality rate: 10%	Hospitalization uncommon Case fatality rate: extremely low

TAKE HOME MESSAGE

- CAP due to Legionella, Chlamydophyla, or Mycoplasma continues to be a diagnostic challenge due to the nonspecific clinical and radiographic presentations.
- The vague clinical presentations of atypical CAP contribute to its underdiagnosis and under-reporting.
- Advancements in diagnostic techniques bring hope to rapid and accurate diagnosis of atypical CAP.
- Macrolides and respiratory fluoroquinolones are currently the antibiotics of choice

سپاس از توجه شما