



Atypical Pneumonia ***(Mycoplasma, Chlamydia,*** ***Legionella)***

University of Jordan

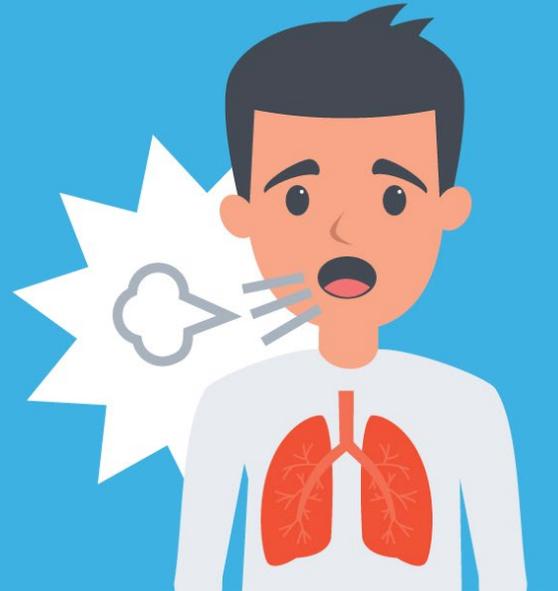
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What Is Walking Pneumonia?



Atypical bacterial pneumonia

- Infection of the LRT involving the pulmonary parenchyma. Inflammation is interstitial rather than alveolar (lobar).
- Causes: *Mycoplasma pneumoniae*, *Chlamydia pneumoniae*, and *Legionella pneumophila*.
- Causes diffuse interstitial pneumonitis. The alveoli usually remain air-filled, and it results in patchy or ground-glass infiltrates on imaging with poor correlation between CXR findings and physical exam.
- Subacute onset with dry cough, headache, myalgias, malaise. Patients often appear less sick than imaging suggests “Walking pneumonia”

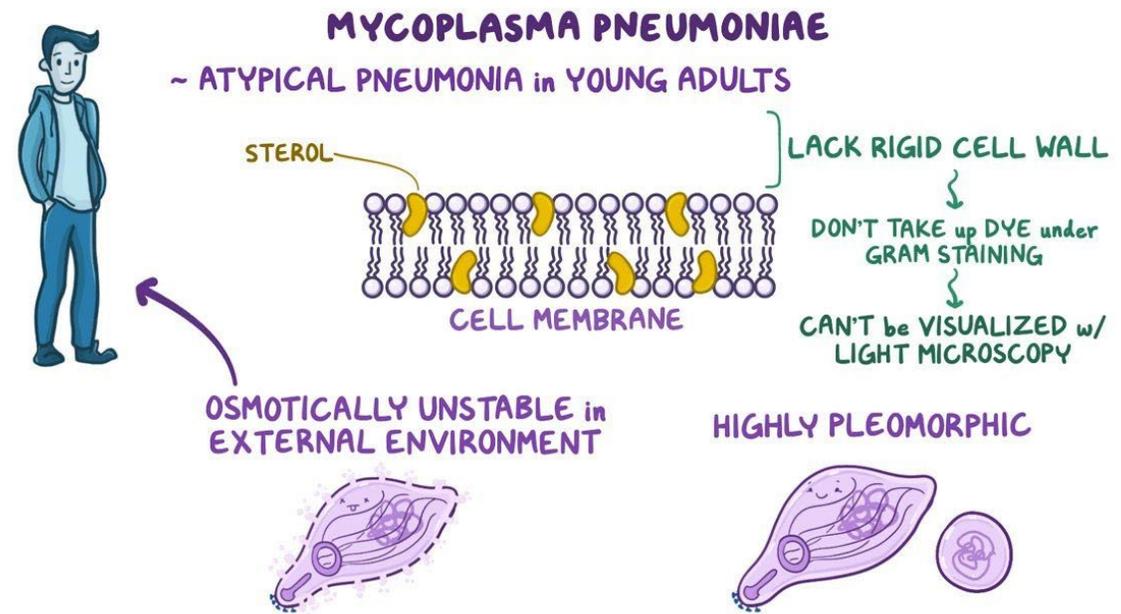


Mycoplasma pneumoniae

Microbiological Features



- The smallest free-living bacterial organism.
- Strict human pathogen.
- Transmitted via respiratory droplets.
- Lacks a cell wall; therefore, it is NOT visible on Gram stain and intrinsically resistant to β -lactam antibiotics.
- Cell membrane rich in sterols which provides structural stability and is unique among bacteria
- Characterized by slow and fastidious growth and it requires special artificial media. Culture rarely used clinically because of low sensitivity and long turnaround time

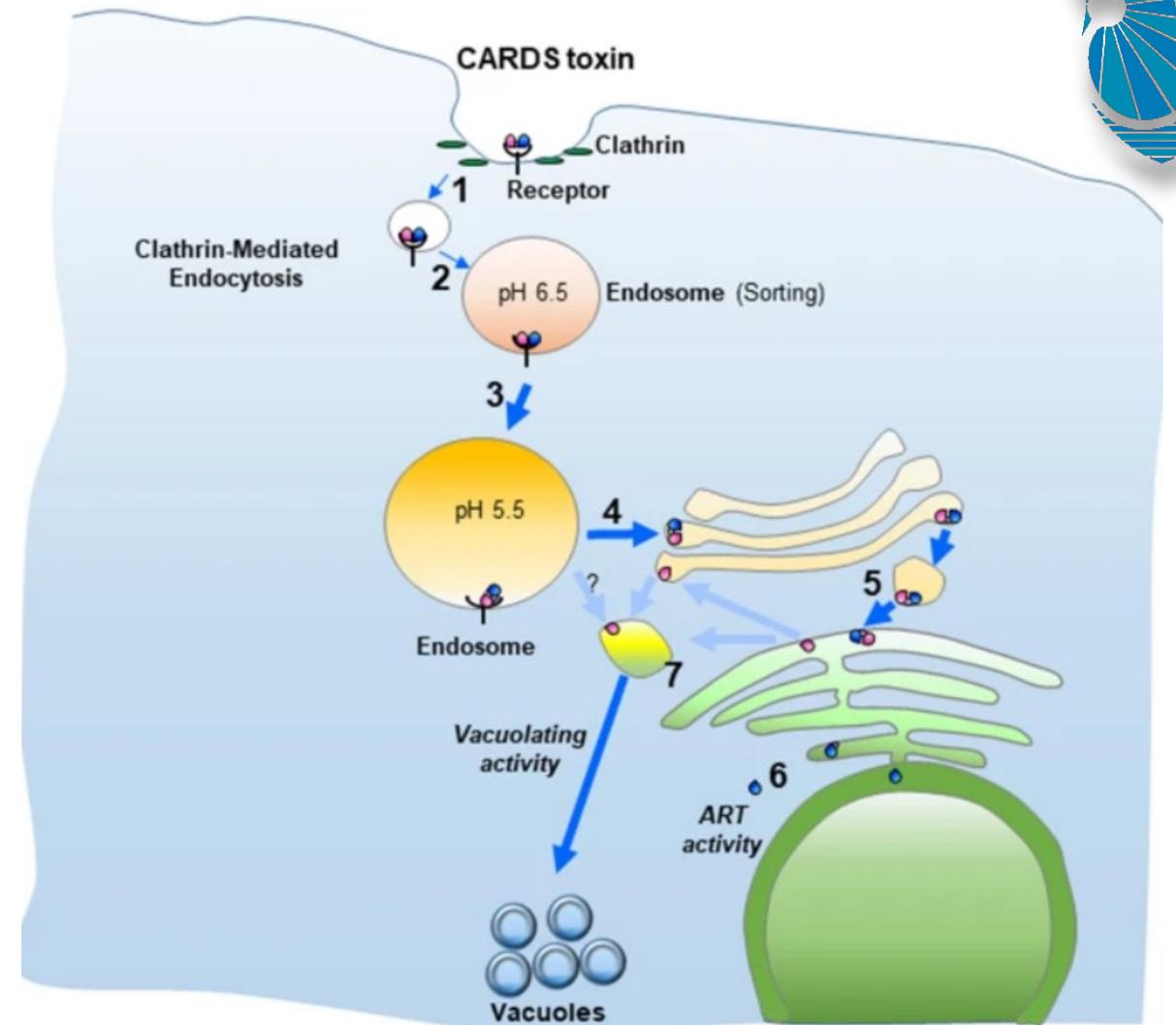




Pathogenesis of *M. pneumoniae*



- *M. pneumoniae* P1 adhesin binds to ciliated respiratory epithelial cells with tight attachment preventing mechanical clearance. The main target is the tracheobronchial tree.
- *M. pneumoniae* produces CARDS toxin (Community-Acquired Respiratory Distress Syndrome toxin). ADP-ribosylates host proteins leading to direct epithelial injury ciliary dysfunction.
- Loss of ciliary function results in impaired mucociliary clearance which explains the dry, persistent cough and prolonged symptoms despite mild disease

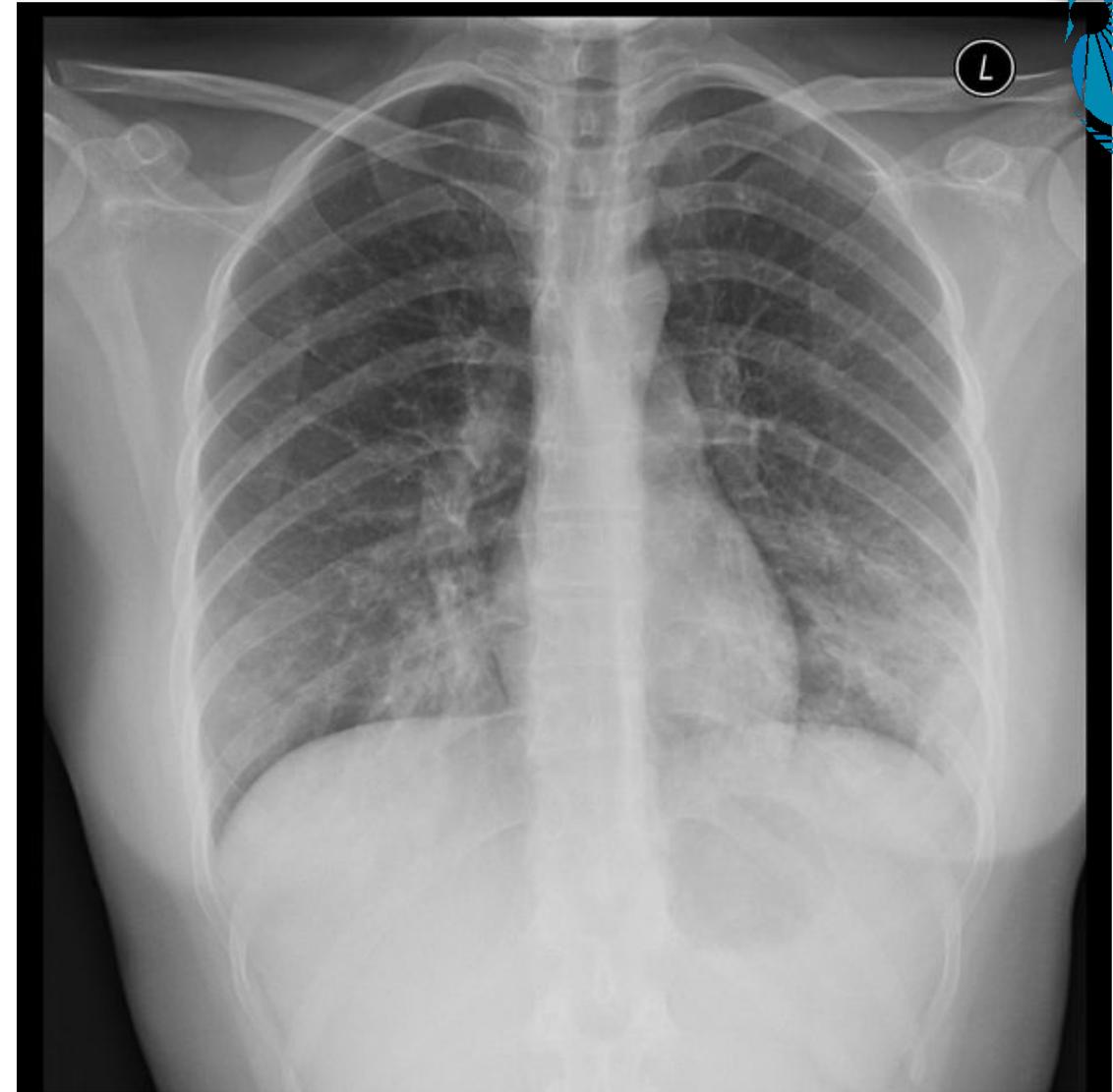


Source: Ramasamy, K., Balasubramanian, S., Kirkpatrick, A. et al. *Mycoplasma pneumoniae* CARDS toxin exploits host cell endosomal acidic pH and vacuolar ATPase proton pump to execute its biological activities. *Sci Rep* 11, 11571 (2021).



Pathogenesis of *M. pneumoniae*

- *M. pneumoniae* induces peri-bronchial inflammation and interstitial inflammation which triggers cytokine release and airway hyperreactivity (wheezing, asthma-like symptoms).
- Inflammation is interstitial, not alveolar with minimal exudate within alveoli. This explains the diffuse CXR infiltrates and poor correlation between imaging and physical findings.



Source: Weerakkody Y, Silverstone L, Rasuli B, et al. Mycoplasma pneumoniae. Reference article, Radiopaedia.org (Accessed on 20 Dec 2025) <https://doi.org/10.53347/rID-25082>

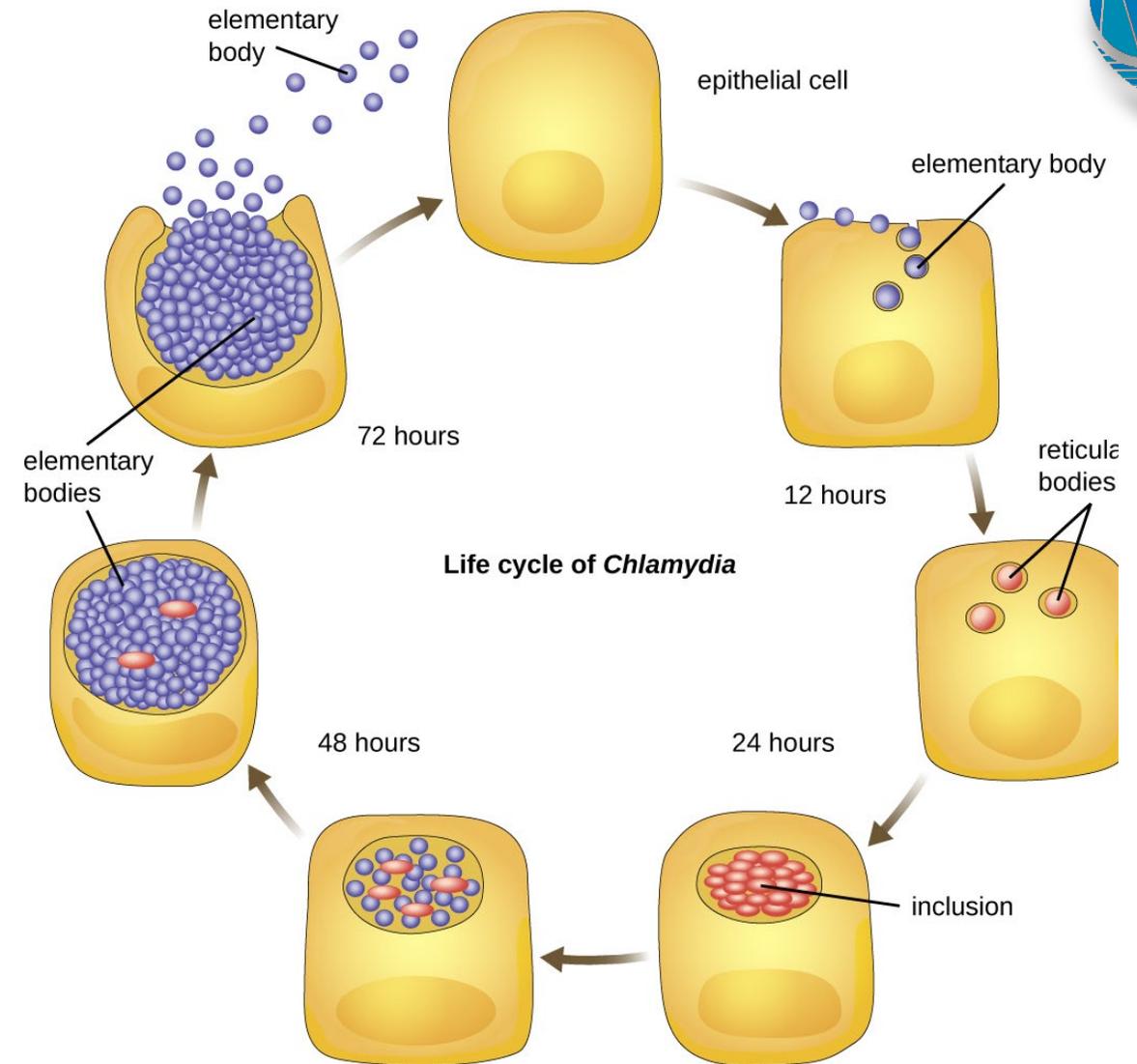


Chlamydia pneumoniae

Microbiology



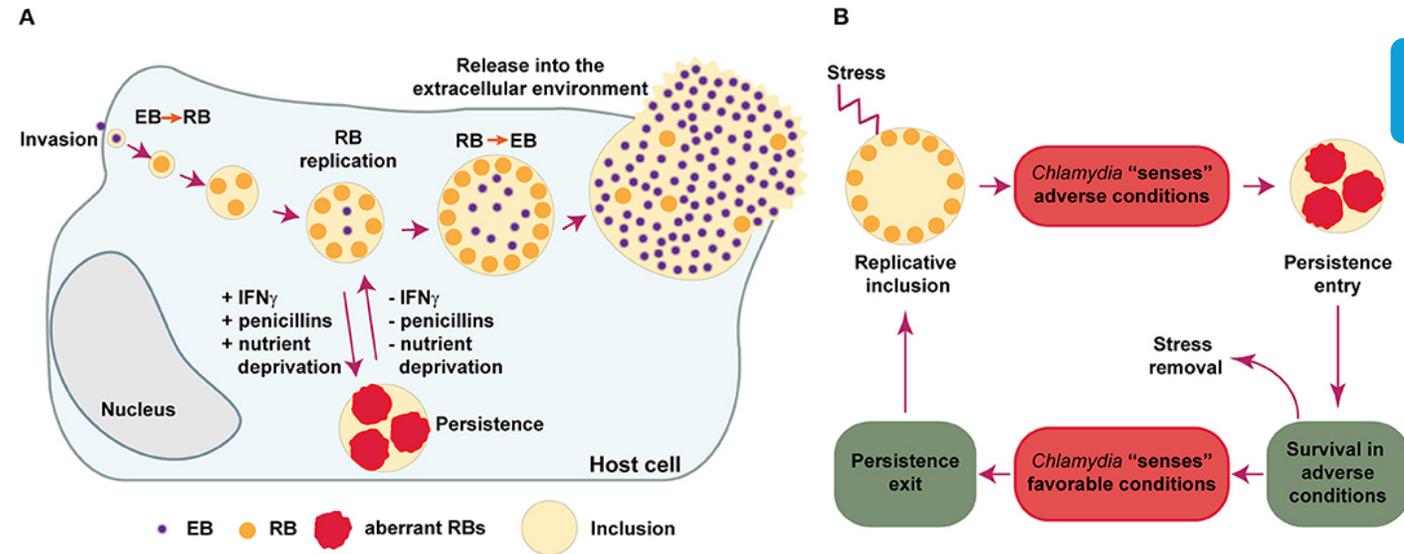
- Obligate intracellular bacterium that is Gram-negative-like (but poorly visualized on Gram stain). It is energy-dependent on host cell (cannot generate sufficient ATP).
- *Chlamydia pneumoniae* exists in two distinct forms:
- **Elementary Body (EB)** which is the infectious extracellular metabolically inactive form that attaches to and enters host cells
- **Reticulate Body (RB)** which is non-infectious intracellular metabolically active form that replicates within host cell inclusions
- *Chlamydia pneumoniae* infects the mucosal epithelial cells and macrophages which explains the persistent infection and chronic or relapsing symptoms





Pathogenesis of *C. pneumoniae*

- Spread via respiratory droplets from person-to-person and is common in close-contact settings (households, schools, military)
- The EB reaches the LRT and attaches to respiratory epithelial cells.
- After entry EB transforms into RB which replicates within a membrane-bound intracellular inclusions
- Persistent intracellular infection helps to evade immune clearance and leads to chronic or relapsing inflammation
- Induces chronic low-grade inflammation predominantly peri-bronchial and interstitial minimal alveolar exudate without lobar consolidation



Source: Panzetta ME, Valdivia RH and Saka HA (2018) Chlamydia Persistence: A Survival Strategy to Evade Antimicrobial Effects in-vitro and in-vivo. Front. Microbiol. 9:3101.



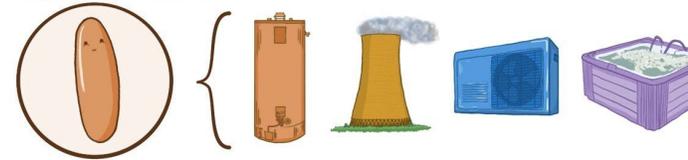
Legionella pneumophila Microbiology



- Gram-negative rods poorly visualized on Gram stain and best seen with silver stain.
- Facultative intracellular pathogen that replicates within macrophages
- Thrives in aquatic environments with common sources such as cooling towers, air-conditioning systems, hot tubs. It survives and replicates within amoebae which protects *Legionella* from harsh environments and enhances virulence

LEGIONELLA PNEUMOPHILA → LEGIONELLOSIS

* GRAM-NEGATIVE BACILLUS



* TRANSMITTED by INHALING INFECTED AEROSOLS

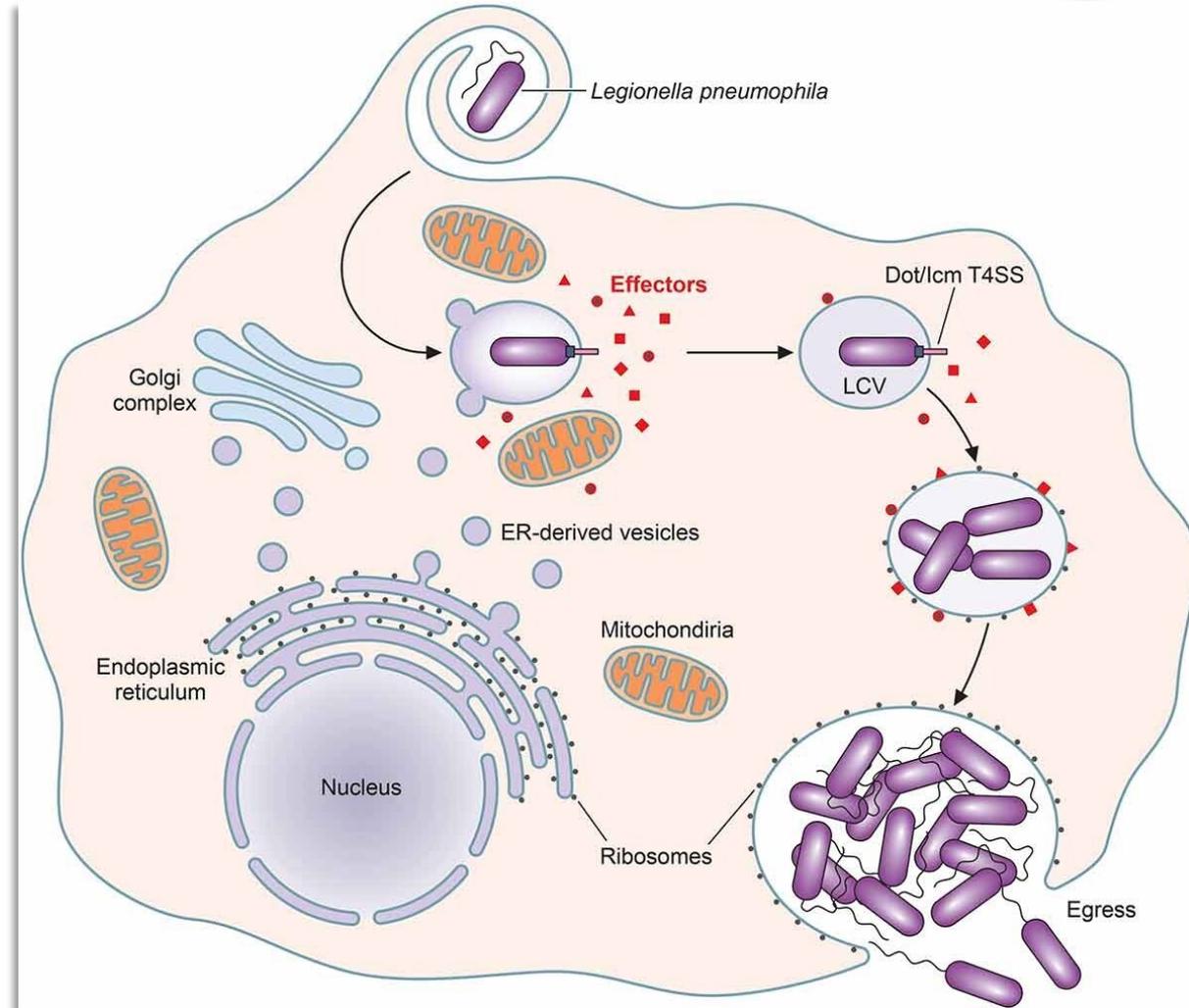




Pathogenesis of *Legionella pneumophila*



- Inhaled via aerosolized water and reaches alveoli and taken up by alveolar macrophages.
- Intracellular survival is the key virulence mechanism and achieved by using type IV secretion system. It blocks phagosome-lysosome fusion and creates a protected intracellular environment
- *L. pneumophila* replicates within modified intracellular vacuoles and avoids intracellular killing leading to high bacterial burden
- *L. pneumophila* triggers intense inflammatory reaction resulting in severe pneumonia and multi-lobar involvement with systemic inflammation contributing to hyponatremia (SIADH-like), among other extrapulmonary manifestations (GI, neurologic).



Source: Chauhan, D., & Shames, S. R. (2021). Pathogenicity and Virulence of Legionella: Intracellular replication and host response. *Virulence*, 12(1), 1122–1144.



Atypical pneumonia clinical features

Feature	<i>Mycoplasma pneumoniae</i>	<i>Chlamydia pneumoniae</i>	<i>Legionella pneumophila</i>
Onset	Gradual	Insidious	Acute
Dominant site	Lower airways	Upper airways	Lung + systemic
Cough	Dry, persistent	Prolonged	Variable
URT symptoms	Uncommon	Common (hoarseness, pharyngitis)	Rare
Wheezing	Common	Uncommon	Uncommon
Systemic features	Mild	Minimal	Prominent
GI symptoms	No	No	Yes
Key lab clue	Cold agglutinins	None	Hyponatremia
Radiology	Patchy interstitial	Mild interstitial	Multi-lobar
Severity	Mild-moderate	Mild, prolonged	Severe



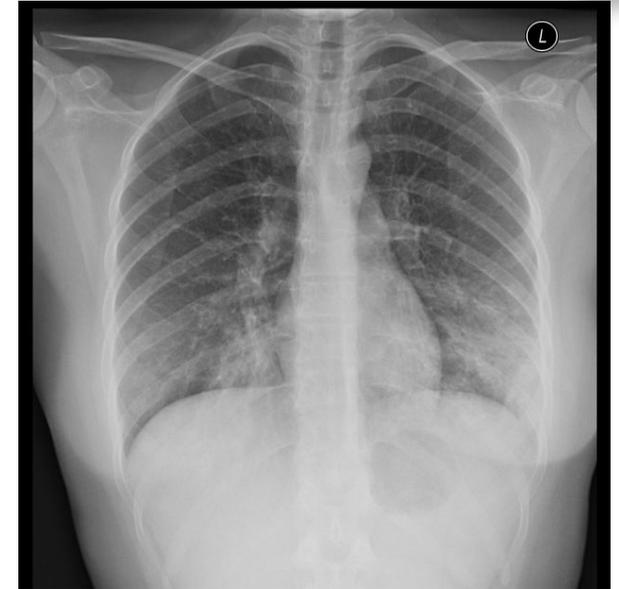
Diagnosis - Radiologic features of atypical pneumonia



- Diffuse interstitial infiltrates
- Patchy, non-lobar consolidation
- Peri-bronchial thickening
- Chest X-ray may appear worse than clinical status which is classic for *Mycoplasma pneumoniae* and *Chlamydia pneumoniae*
- *Legionella pneumophila* multi-lobar consolidation and rapid radiologic progression. Pleural effusions may be present



Predominantly right sided signs were correlated with this radiograph with almost complete right sided air space opacification and early left basal changes. Diagnosis: atypical pneumonia - Legionnaires' disease



There is marked bronchial wall thickening on the right and left in the perihilar zone extending to the lung base in keeping with inflammatory lower airways disease. There are non-segmental patchy lung opacities in the lower lobes bilaterally (right lower lobe posterior basal segment; left lower lobe anterior basal segment; right middle lobe medial segment).



Diagnosis - Microbiologic features of atypical pneumonia

- *Mycoplasma pneumoniae*: PCR is the most sensitive and rapid (preferred) method. Serology (IgM/IgG) is useful but delayed. Cold agglutinins are non-specific, low sensitivity. Culture is rarely performed.
- *Chlamydia pneumoniae*: PCR from nasopharyngeal swab or sputum. Serology: Fourfold rise in IgG indicates a recent infection. Single IgG titers are difficult to interpret. Culture is only done in specialized laboratories.
- *Legionella pneumophila*: Urinary antigen test is rapid, widely used. PCR on sputum or BAL fluid. Culture on BCYE (Buffered Charcoal Yeast Extract) agar is required for outbreak investigation. DFA testing is done on specialized labs only

QIAstat-Dx Respiratory SARS-CoV-2 Panel – 23 bacterial and viral pathogens	
Viruses	Bacteria
Influenza A	Parainfluenza virus 1
Influenza A subtype H1N1/2009	Parainfluenza virus 2
Influenza A subtype H1	Parainfluenza virus 3
Influenza A subtype H3	Parainfluenza virus 4
Influenza B	Respiratory syncytial virus A/B
Coronavirus 229E	Human metapneumovirus A/B
Coronavirus HKU1	Adenovirus
Coronavirus NL63	Bocavirus
Coronavirus OC43	Rhinovirus/Enterovirus**
SARS-CoV-2	

- Mycoplasma pneumoniae*
- Legionella pneumophila*
- Bordetella pertussis*
- Chlamydia pneumoniae*



M813
Legionella pneumophila
33153





Antimicrobial therapy for atypical pneumonia



- *Mycoplasma* and *Chlamydia*
- First-line options: Macrolides (azithromycin, clarithromycin), Doxycycline
- Alternatives: Respiratory fluoroquinolones (levofloxacin, moxifloxacin)
- *Legionella*
- First-line options: Azithromycin (high-dose), fluoroquinolones (levofloxacin preferred)



Infection Control (Atypical Pneumonia)



- *Mycoplasma* and *Chlamydia*
- Control measures: Respiratory hygiene and masking. Isolation of symptomatic patients during outbreaks (e.g., schools, dormitories)
- *Legionella*
- No person-to-person spread.
- Sources: Cooling towers, air-conditioning systems, hot tubs, hospital water systems.
- Control measures: Water system chlorination. Superheating and flushing. Copper-silver ionization. Regular monitoring of hospital and industrial water systems.



اغلاق فندق بالبحر الميت واخلاء نزلاءه بعد انتشار بكتيريا خطيرة!



وكالة جراسا الاخبارية :

خاص - كشف مصدر مطلع بان وزير الصحة د. محمود الشيباب، أصدر قرارا بإغلاق أحد الفنادق بمنطقة البحر الميت بالشمع الأحمر، بسبب وجود 'بكتيريا الليجيونيليا' في مياه الاستحمام المستخدمة داخل مرافق الغرف الفندقية.

واكد المصدرمن ان قرار الإغلاق اعقبه قرار إخلاء 164 نزyla من الفندق حماية لهم، فيما تم إيقاف الحجوزات في الفندق الذي يضم 140 غرفة.

واشار المصدر، الى أن لجنة صحية تم تشكيلها لمتابعة ملابسات الواقعة، للوقوف على اسبابها، ومتابعة تصويب اوضاعها

وتعتبر المياه الراكدة في مواسير الامدادات مرتعا خصبا لنمو تلك البكتيريا سيما اذا لم يتم استخدامها لفترات زمنية طويلة ، وتتسبب البكتيريا المشار اليه بمشكلات صحية تتعلق بمجرى التنفس والرنيتين حال تعرض لها الشخص.

Source: <https://www.gerasanews.com/article/310492> جميع الحقوق محفوظة



Psittacosis

- Caused by *Chlamydia psittaci*. Zoonotic inhalation of aerosolized bird secretions or dried feces. Associated with parrots, parakeets, pigeons, poultry. No human-to-human transmission
- High fever, headache, myalgia, dry cough, and can cause severe systemic illness (hepatosplenomegaly, hepatitis).
- Clinical suspicion and exposure history (birds) help in diagnosis while PCR or serology is used to confirm diagnosis.
- Doxycycline is the drug of choice. Macrolides as alternatives (e.g., pregnancy)



What Are The Symptoms Of Parrot Fever (Psittacosis)?

For Information, Visit: www.ePainAssist.com





Thank You!
Wishing you all the best!