

# Microbiology lecture 2

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## 1. *Mycoplasma pneumoniae*

• **Microbiology:** This is the smallest free-living bacterial organism and is a strict human pathogen. It lacks a cell wall, making it invisible on a Gram stain and intrinsically resistant to beta-lactam antibiotics. Its cell membrane is unique among bacteria because it is rich in sterols, providing structural stability. It is characterized by slow, fastidious growth on special artificial media.

• **Pathogenesis:** The P1 adhesin binds to ciliated respiratory epithelial cells, primarily in the tracheobronchial tree. It produces the CARDS toxin (Community-Acquired Respiratory Distress Syndrome toxin), which ADP-ribosylates host proteins, leading to epithelial injury and ciliary dysfunction. This loss of function impairs mucociliary clearance, causing a dry, persistent cough. It triggers peri-bronchial and interstitial inflammation, which can cause wheezing or asthma-like symptoms.

• **Clinical Features:** The onset is gradual, typically affecting the lower airways. It is often called "walking pneumonia" because patients appear less sick than their imaging suggests. While systemic features are usually mild, wheezing is common.

• **Diagnosis & Treatment:** PCR is the preferred method as it is the most rapid and sensitive. Cold agglutinins may be present but are non-specific. Radiology often shows patchy interstitial infiltrates and peri-bronchial thickening. First-line treatment includes Macrolides (Azithromycin) or Doxycycline.

**Mycoplasma** —  
Anatomically Gram  $\ominus$ , Atypicals

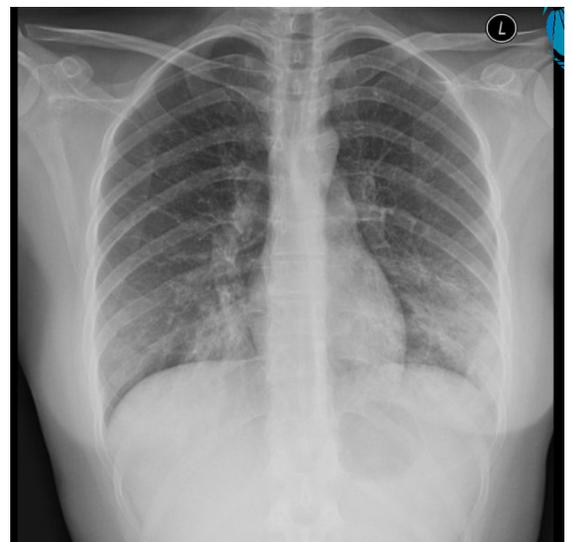
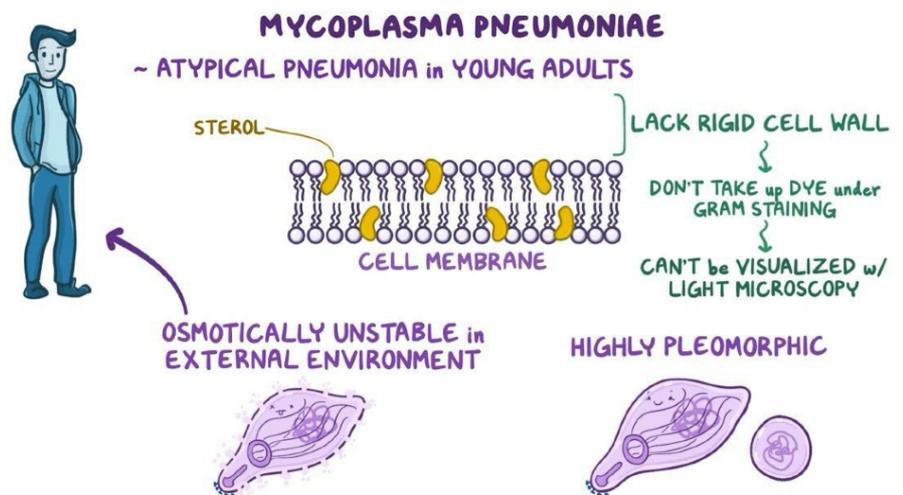
- No cell wall  $\rightarrow$  No Gram stain.  
- Cholesterol cell membrane.

— Atypical Pneumonia  
— Erythema Multiforme

— AIHA — Cold (IgM)

Eaton's agar  
Mulberry colonies

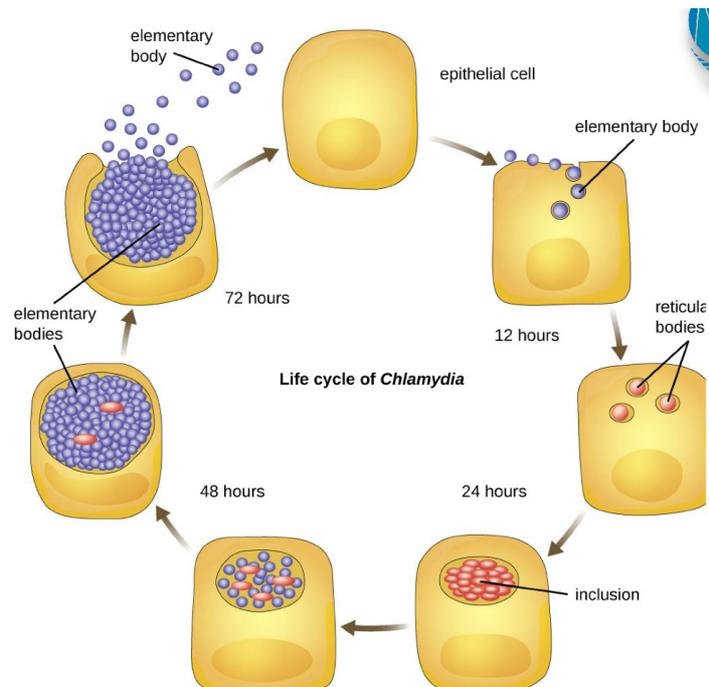
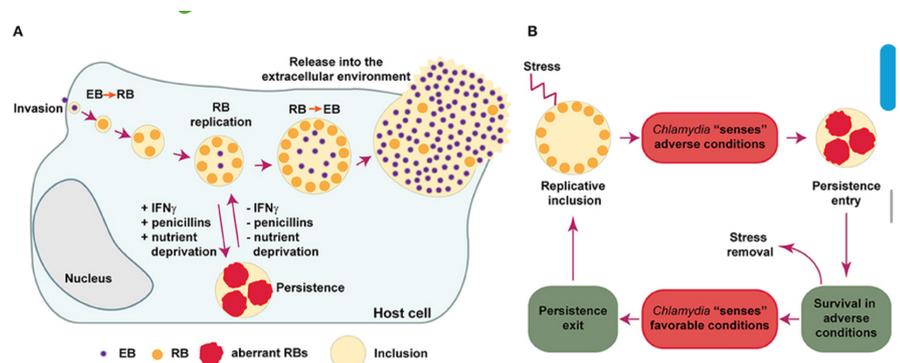
**Tetracycline**  
**Erythromycin**



## 2. Chlamydia pneumoniae

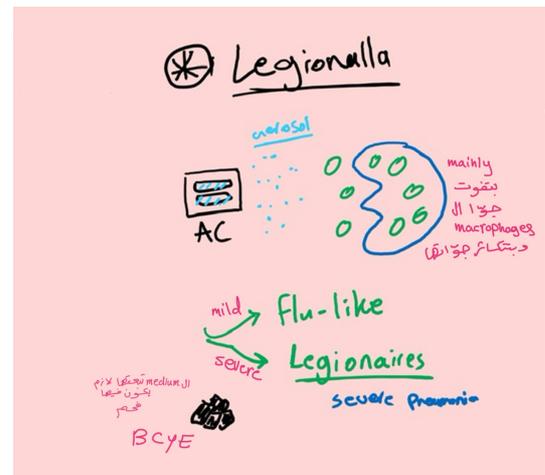
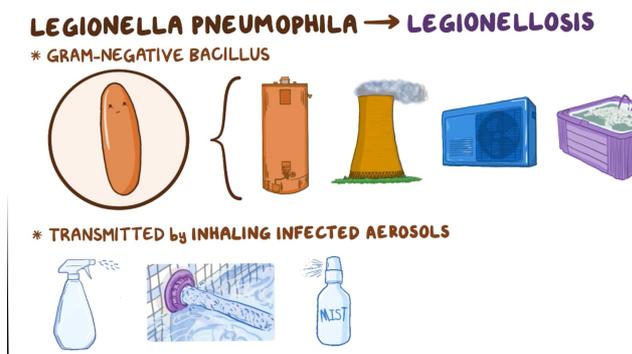
- **Microbiology:** This is an obligate intracellular bacterium that is energy-dependent on the host cell because it cannot generate sufficient ATP. It exists in two distinct forms: the Elementary Body (EB), which is the infectious, extracellular form, and the Reticulate Body (RB), which is the non-infectious, intracellular replicative form.
- **Pathogenesis:** Transmission occurs person-to-person via respiratory droplets in close-contact settings. The EB attaches to respiratory epithelial cells and, once inside, transforms into the RB to replicate within membrane-bound inclusions. This intracellular life cycle helps it evade immune clearance, leading to chronic or relapsing inflammation.
- **Clinical Features:** The onset is insidious, often starting in the upper airways with symptoms like hoarseness and pharyngitis. It typically causes a prolonged cough and mild, protracted illness with minimal systemic features.
- **Diagnosis & Treatment:** Diagnosis is made via PCR from nasopharyngeal swabs or serology (a fourfold rise in IgG). Radiology typically shows mild interstitial infiltrates. Like Mycoplasma, it is treated with Macrolides or Doxycycline.

Medicosis	Chlamydia
Gram	Anatomically Gram $\ominus$ , Atypicals
Characteristic	Obligate Intracellular (cannot make its own ATP) Elementary body: infects. Reticulate body: replicates.
Disease	- STI - Genital ulcer - UTI - Follicular Conjunctivitis (neonatal " " ) Urethritis/cystitis Pyelo - Trachoma - PID - Atypical Pneumonia (neonatal " " ).
Dx	Giemsa stain cell wall lacks muramic acid. Inclusion Bodies NAAT / PCR
Tx	Azithromycin Doxycycline



### 3. Legionella pneumophila

- **Microbiology:** This is a Gram-negative rod that is poorly seen on a Gram stain and is best visualized using a silver stain. It is a facultative intracellular pathogen that thrives in aquatic environments (cooling towers, hot tubs, air conditioning) and survives within amoebae.
- **Pathogenesis:** Infection occurs by inhaling infected aerosols from water sources; there is no person-to-person spread. Once in the lungs, it is taken up by alveolar macrophages. It uses a Type IV secretion system to block phagosome-lysosome fusion, allowing it to replicate within modified vacuoles and reach a high bacterial burden.
- **Clinical Features:** The onset is acute and severe. It causes prominent systemic features, including gastrointestinal symptoms (diarrhea) and neurological manifestations.
- **Diagnosis & Treatment:** A urinary antigen test is a rapid and widely used diagnostic tool, though PCR and culture on BCYE agar are also utilized. Laboratory clues include hyponatremia. Radiology shows multi-lobar consolidation and rapid progression. Treatment requires high-dose Azithromycin or Fluoroquinolones (Levofloxacin).



### 4. Chlamydia psittaci (Psittacosis)

- **Microbiology & Transmission:** This is a zoonotic infection caused by the inhalation of aerosolized secretions or dried feces from infected birds (parrots, pigeons, poultry).
- **Clinical Features:** It presents with high fever, severe headache, myalgia, and a dry cough. It can lead to severe systemic illness involving hepatosplenomegaly or hepatitis.
- **Diagnosis & Treatment:** Diagnosis relies on a history of bird exposure confirmed by PCR or serology. Doxycycline is the drug of choice, with Macrolides used as an alternative.

↪ in pregnancy